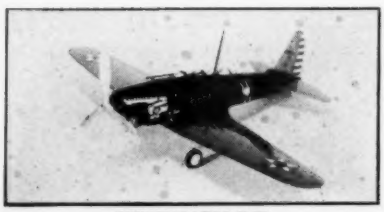
MODEL AIRPLANE NEWS

MARCH
1936
20¢

U. S. Navy
Grumman F2F-1



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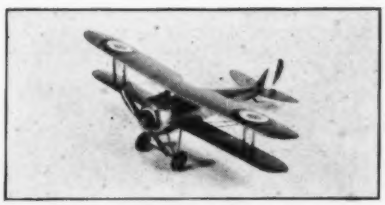

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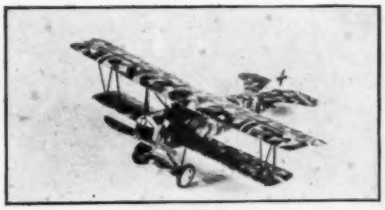

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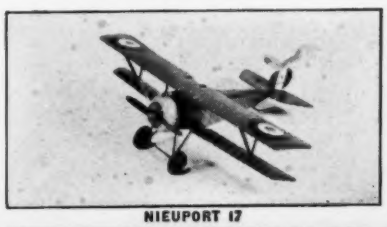

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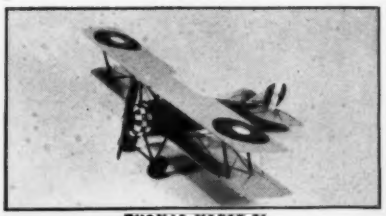

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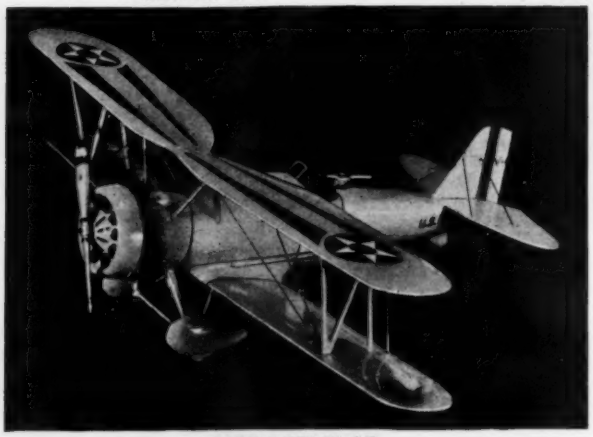

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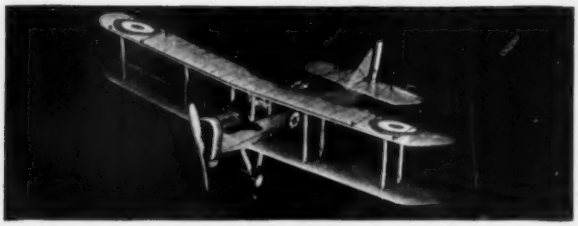
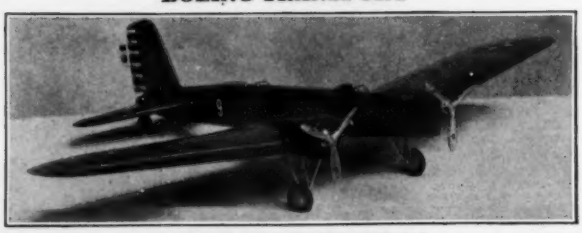


DEHAVILAND 4

BOEING F4B-4 (re-designed)

BOEING TRANSPORT



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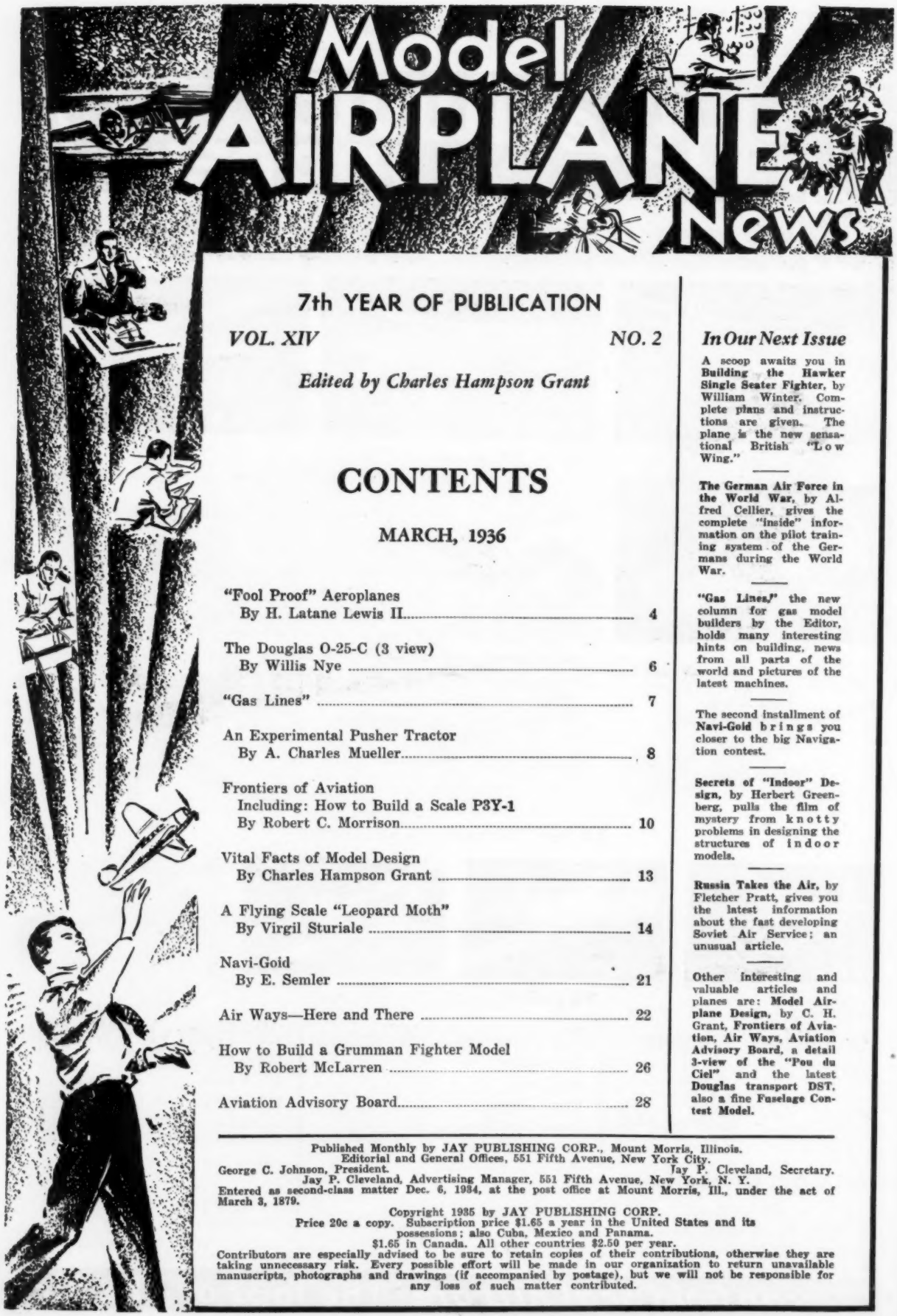

7th YEAR OF PUBLICATION

VOL. XIV *NO. 2*

Edited by Charles Hampson Grant

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MARCH, 1936

In Our Next Issue

A scoop awaits you in **Building the Hawker Single Seater Fighter**, by William Winter. Complete plans and instructions are given. The plane is the new sensational British "Low Wing."

The German Air Force in the World War, by Alfred Cellier, gives the complete "inside" information on the pilot training system of the Germans during the World War.

"Gas Lines," the new column for gas model builders by the Editor, holds many interesting hints on building, news from all parts of the world and pictures of the latest machines.

The second installment of **Navi-Goid** brings you closer to the big Navigation contest.

Secrets of "Indoor" Design, by Herbert Greenberg, pulls the film of mystery from knotty problems in designing the structures of indoor models.

Russia Takes the Air, by Fletcher Pratt, gives you the latest information about the fast developing Soviet Air Service; an unusual article.

Other interesting and valuable articles and planes are: **Model Airplane Design**, by C. H. Grant, **Frontiers of Aviation**, **Air Ways**, **Aviation Advisory Board**, a detail 3-view of the **"Pou du Ciel"** and the latest **Douglas** transport **DST**, also a fine **Fuselage Contest Model.**

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Actual photograph 1936 AERONCA Model L-A in flight

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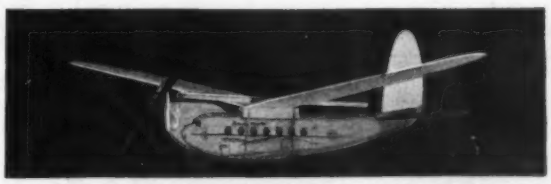

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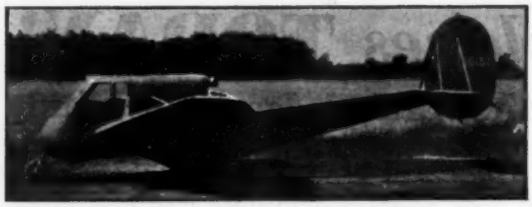
The Hammond Y "fool-proof" airplane built to meet the U. S. Department of Commerce specifications

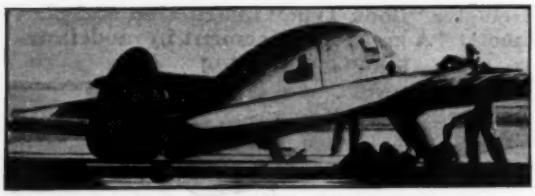
"Fool-Proof"

What Is Required of Airplanes for the Average Built to Fulfill All

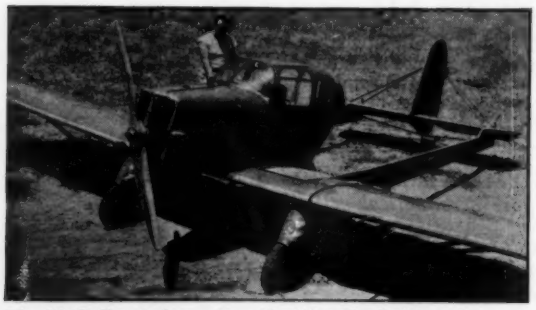
By H. LATANÉ LEWIS II



Side view of the Hammond Y plane. The three wheel landing gear insures a safe take off and landing



The "Crusader" AG-4 built by the American Gyro Co. A clever design, well streamlined and powered with two engines



The McGaffey Aviate powered with a Ford V-8 engine and composed of many parts of standard manufacture

The Pitcairn roadable autogyro with rotor blades folded. Its size compares with an ordinary auto

JUST what should the ideal airplane for use by the man who flies for the fun of it be like? There is fast growing up in the United States a large group of sportsmen who have forsaken sailing, horseback riding and golf, for the more exhilarating pastime of flying. As most of them fly only in their spare time, they cannot be expected to develop the judgment and skill of the professional pilot. So Uncle Sam has decided that the amateur should have a plane all his own—one that is as nearly foolproof as it is possible to make it. He is sponsoring the development of ships that almost anyone who isn't blind in both eyes and crippled in both arms and legs can handle with ease.

A special Development Section, composed of some of the finest engineers and pilots in this country, has been organized as a part of the Bureau of Air Commerce and for the past year has been tackling the problem tooth and nail. And now its work is bearing fruit. Queer-looking craft, the like of which have never been seen before, are beginning to drop down on Bolling Field at Washington for exhaustive tests by Bureau pilots. Veteran Army flyers at the post are kept gasping at the way these little jobs perform.

The Development Section hasn't stopped at bringing out a plane as nearly perfect as possible. Other related problems are being solved as well. Engines, propellers, belt drives and such, are getting their share of attention, too.

The reason that the Bureau has suddenly started giving the amateur such a boost is that its statisticians in compiling records for the past few years, discovered startling facts. While scheduled transport flying is having a boom, private flying has gone steadily backward until at present it is in a sad state. Not only that, but accidents and fatalities among amateurs are seriously high. So government officials decided that it was high time that something was done.

The planes that have been developed are designed to improve these four factors: usefulness, comfort, safety and low cost.

The thing that dub pilots have the greatest trouble with is landing. Some of them just can't seem to learn where the ground is located. They think that it is about ten feet lower or higher than where it really is. In conventional airplanes, a mistake like that usually means a ride in the ambulance and one less airplane at the airport. Several of the new ships, however, will practically land themselves. All the pilot has to do is keep the stick back to hold the nose up and let the plane settle down of its own accord, in some cases slower than a parachute. And landings can be made with a degree of accuracy that was formerly attained only by crack pilots.

Cross wind landings are another phase of bringing a plane back to earth that frequently causes grief to the inexperienced. Amateurs in many cases operate out of small fields which may at times necessitate cross wind landings. And landing a modern plane that way without mussing up the landscape is a delicate process. These new jobs, however, are not much affected by a wind on their sides and the pilot doesn't have to worry about ruddering into it.

The Weick W-1 "Safe" airplane built by the Fairchild Co., one of the most promising of its type

Aeroplanes

Individual and Features of Planes That Have Been of These Conditions

With contributions by FRANK MILLER

He can just come in and sit down without giving a thought to the windsock.

In short, the planes are designed to make all landings good landings.

Probably the most interesting and radical of the new ships is the Weick W-1, designed by Fred Weick of the engineering staff of the National Advisory Committee for Aeronautics and built by the Fairchild Company. This ship is rudderless but is said to be under better control of the pilot than any present type, and turns are no more complicated than in an automobile.

The plane is equipped with flaps of an entirely new type and the conventional ailerons on the trailing edge of the wing are replaced with a combination of slot and aileron which is located in the middle of the wing.

Let's have a talk with John H. Geisse, chief of the Development Section, and get the inside story on this revolutionary plane. Geisse is himself a pilot as well as an engineer, and although he has sons of his own as old as some of his test pilots, he is keeping pace with the best of them in flight-testing the new jobs.

"First in importance of the plane's features," he tells us, "is a landing gear which permits landing at any speed with immediate application of the brakes and which, we believe, will permit cross wind landings without the use of the rudder. Second in importance is an arrangement of engine and tail surfaces so that when the airplane is trimmed to fly at a certain speed, it will maintain that speed automatically, irrespective of any manipulation of the throttle.

"In the conventional airplane there are two maneuvers each of which requires the coordinating of two controls. For turning the airplane in a horizontal plane, both rudder and ailerons are used. For turning the airplane in a vertical plane, that is, changing from climb to level flight to descent, the throttle and the elevators are used.

"With the new type of ailerons, it is hoped to achieve just the right relationship between banking and turning with the ailerons only, obviating the need of a rudder for normal turns. With the new type of flaps, it is expected that there will be no need of using the rudder to shorten the glide of the airplane."

Mr. Geisse states that the new type of flaps are similar to other types in that they cut down the landing speed and make it possible to glide in at a steep angle, which is a big help in getting into restricted areas. They differ, however, in that there are two separate controls, one of which reduces speed and the other reduces gliding angle.

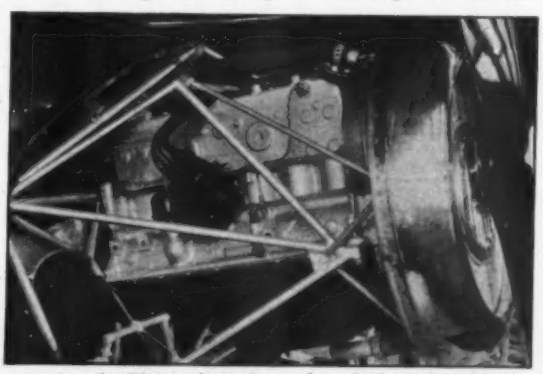
The speed control has two positions, one for all operations near the ground including take-offs and landings, and one for cruising and high speed. It can be left in either position if the pilot desires. The control for gliding angle is connected to the throttle and operates with it automatically as it opens and closes. It is hard for anyone who is not a pilot to appreciate how greatly this simplifies landing. It

(Continued on page 32)

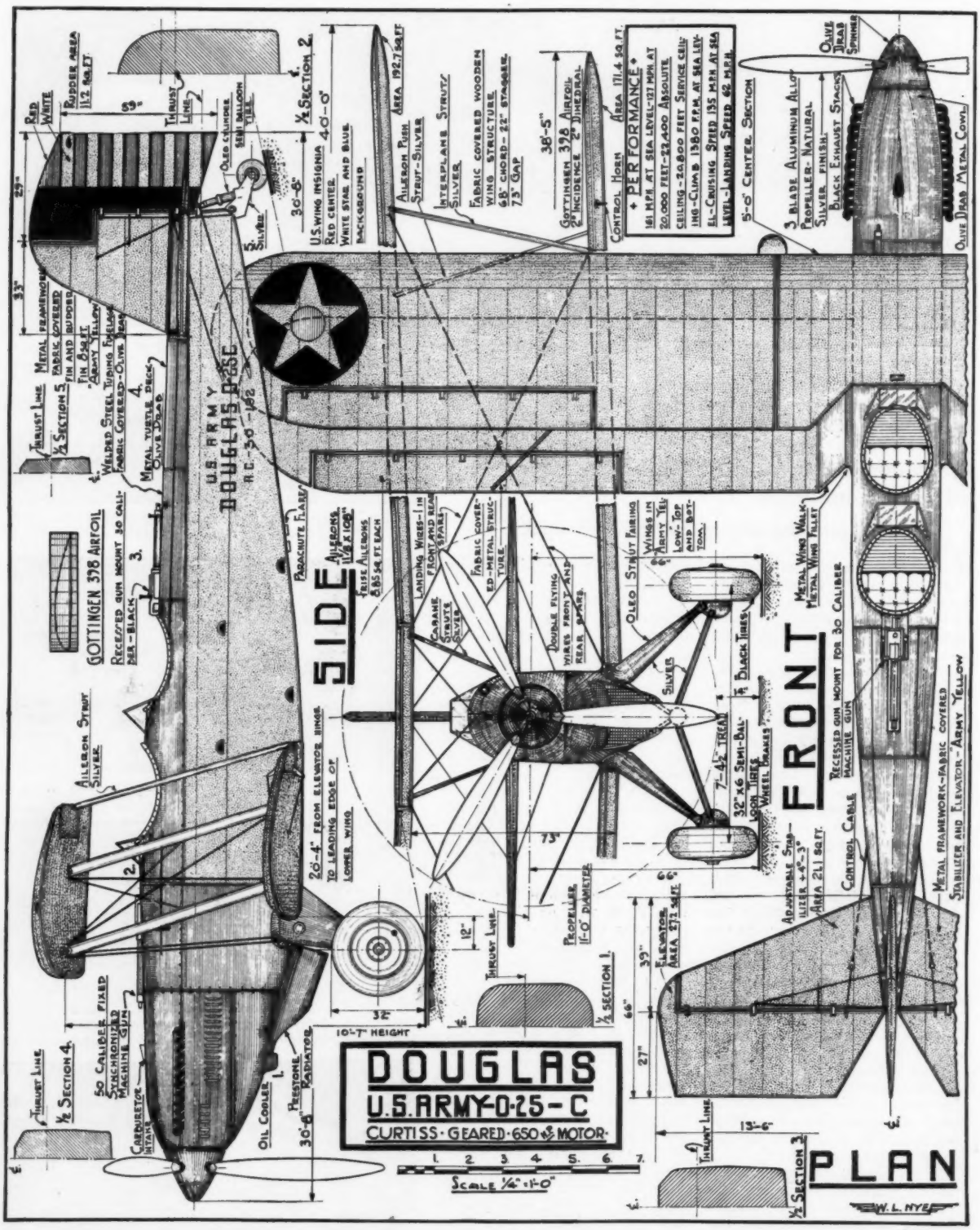
A plane of novel design indicating the extremes fostered in attempts to provide a safe plane

The tailless Waterman safe airplane that has given remarkable demonstrations of stability

The Fahlin Plymo-Coupe that uses a standard Plymouth automobile engine of 85 hp. to reduce production cost



Showing the Plymouth engine and method of mounting in the Fahlin Plymo-Coupe



This airplane is a development of the original Douglas O-2 Observation airplane with major changes both in the power plant and wing arrangement. This airplane has a remarkable performance and has been adopted for various duties in the Air Corps.

It was originally developed to use the Curtiss Conqueror 600 hp. straight drive engine with a water-cooled tunnel radiator. This gave the plane a performance better than the Liberty-powered job. In the final adaptation the Prestone-cooled geared engine was finally chosen with the result the performance compares favorably with foreign planes in the same class.

These planes are of composite construction with a welded steel fuselage and wooden wings. The planes incorporate all the latest observation equipment or they may be used as fighter or attack planes. These planes are now on the obsolete list, their places being taken by the newer observation planes of the army.

The wing combination is a good one. High aspect ratio, a good gap to chord ratio and a moderate wing loading make these planes ideal for cross-country work.

"Gas Lines"

A Presentation of Who's Who in Gas Model Airplane Designing, Building and Flying. Tell Others What You Are Doing

Pict. No. 7. A few Australian "petrol" fans trying out their legs against a KG-3, at a recent Australian contest. Gas models are now the rage in their country

There are hundreds of fans throughout the world, each with some knowledge that would be helpful to other fans. Therefore, in order that a free exchange of ideas may take place with the ultimate result of an increase in knowledge of each individual, "Gas Lines" has been born. In its "Lines" each month "gas" modelers will read what the "other fellow" is thinking and doing. We urge everyone interested in this sport to contribute some news, pictures or features of interest and value so that through this exchange, the aeronautical knowledge of those who will rule aviation in the future will be developed to a high degree. With all of this greater joy and interest will come to each individual.

MANY fans have recognized "Gas Lines," as very helpful and many interesting ideas, pictures and letters have been received. Following are some of the interesting features concerning gas models received from readers.

Mr. L. O. Timblin, who is in charge of the Boys' Department of the Gano-Downs Company of Denver, Colorado, writes and tells of the activities of their club in gas model building and flying He says:

"Picture No. 1 shows what we believe to be the first successfully completed and successfully flown gas-powered model in the Rocky Mountains region. We have had exceedingly fine results from this plane, which is a KG-1 with a modified cabin, occupying the space normally used for the center section struts.

"We have had time up to fourteen minutes, in the evening when the thermal currents have subsided. We were afraid to fly the plane during the heat of the day, because of its marvelous soaring abilities, as demonstrated in its first test flight.

"The plane weighs five pounds and seven ounces. Considering the altitude of Denver, (5,280 feet), we are gratified by the results. This plane, when sent to the Scripps-Howard contest in Cleveland, Ohio, flew out of sight after nine minutes in the air. The model was constructed by Harry Cornish, Junior Aviation League Manager and Robert Van Buskirk, with motor details by Ted Holmes."

What the Gano-Downs club has done with the KG-1 may be of interest to other KG builders, as the picture shows there is a great improvement in the looks of the ship. Evidently its flying qualities have not been reduced. Incidentally, in the same letter, Mr. Timblin mentions a few interesting incidents occurring in the rubber power contest which their club recently held.

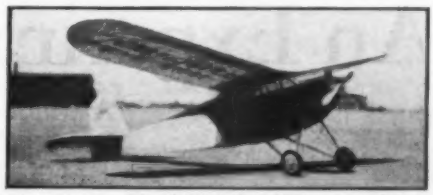
At the last Gano-Downs outdoor contest of the 1935 season, the outstanding occurrence was the breaking of the Class D stick model world record by Robert Van Buskirk (17) with a flight of twenty-four minutes and forty-seven seconds. The model was then lost from sight north of the airport. The flight placed first in the senior division of the Stick Model Contest."

Next month we will show other pictures of this gas job.

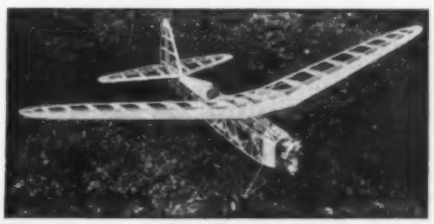
Elbert J. Weathers of 2720 Poinsettia Drive, San Diego, Calif., writes and tells us something about his four foot gas job powered with an Elf inverted engine. Picture No. 2 shows the ship before it was covered. It is unquestionably very efficient and neat-looking. He writes as follows:

"The ship flew eight minutes on its first test flight, with gas in carburetor (full) only. I shortly intend

(Continued on page 40)



Pict. No. 1. Lloyd Timblin's KG gas model to which he has added a cabin. It flies well in the high altitude of Denver, Colo.



Pict. No. 2. A four foot gas job by Elbert Weathers, powered with an Elf engine. It is a consistent flier

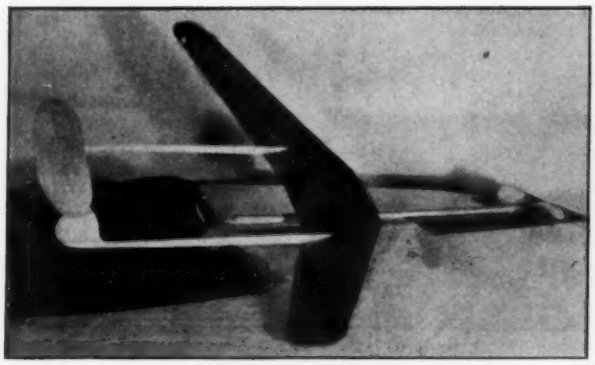
Pict. No. 5 Emerson Elwell's KG model with which he has made 25 flights so far with only minor crack-ups

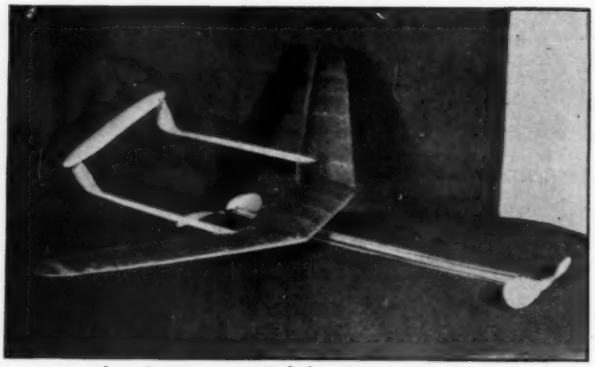
Pict. No. 8. A Lockheed Vega gas job built by Douglas Dickie of Sydney, Australia

Pict. No. 3. Frank Gerstenmier's model taking off at the Eastern States Meet, 1935. Gerstenmier, left, and Shereshaw watch anxiously

Pict. No. 4. Wm. McKenzie Jr. with his gas job at a contest in California. It has a 6½ ft. span

Pict. No. 6. Model builder Petrodes with his "gas hopper" at the Lakehurst Junior Birdmen contest. He is now building his third model





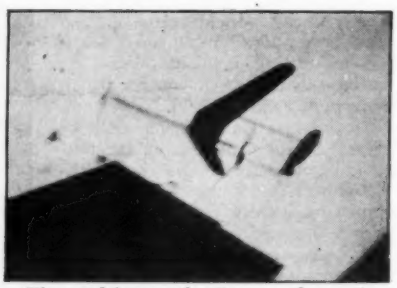
The finished model of unusual design provides a means of testing many untried theories

An Experimental Pusher-Tractor

A Unique Two Propeller Model That Is a Remarkable Flyer and Which Will Afford Many Moments of Joy and Excitement

By A. CHARLES MUELLER

FIRST let us look at the model, about which construction details will be described later. The model which was originally built for no other purpose than experimentation is a most stable flyer due to its unfailing power through the use of twin propellers, one at each end of the motor stick. The advantage of such a motor arrangement is this; each prop requires less rubber and consequently the motors have more duration. Then too, the double propellers eliminate torque, as they turn in opposite directions, thus adding to the models inherent stability. The sufficiently large wing with its sweepback as well as dihedral and original airfoil section, provides plenty of lift for this slow-speed plane. The tail empennage has been purposely kept out of the prop wash so that it receives a steady uninterrupted flow of wind in forward flight. The construction is comparatively simple and will not create many problems for even the beginner. If the plans are religiously followed, the beginner will be rewarded with fine flights. Then too, the design adapts itself to numberless changes, should the more scientific builder decide to experiment further. Perhaps with a newly designed wing, a tailless model of worth might be rigged from the original design. There are other ideas which might also be worked out. However, we will leave these possibilities for a later discussion.

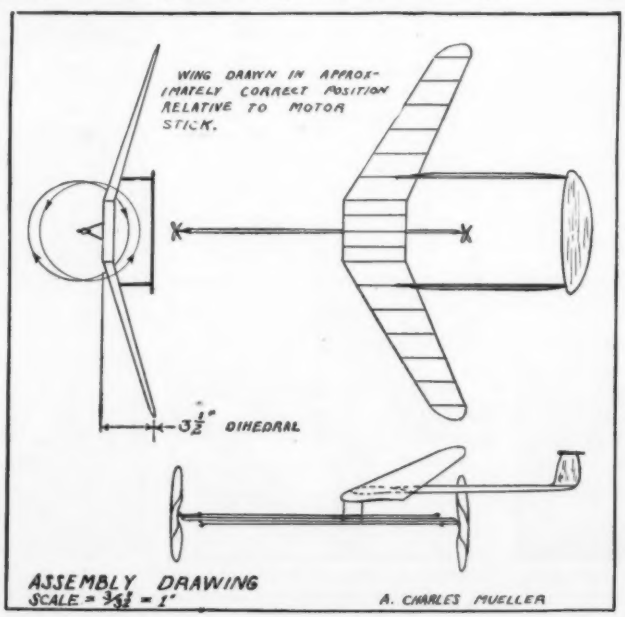


The model starts for "parts unknown"

Wing

First cut all necessary ribs from 1/32" sheet stock, with the exception of rib No. 2 which is cut from 1/16" sheet balsa. First build the center section consisting of five ribs (No. 1), one ⅛" spar, one leading edge measuring 9/32" x ⅛" x 4" and one trailing edge measuring 1/16" x 3/16" x 4". May I say at this time that both spars and trailing edges should be made from hard balsa. Now the panels are arately on the original model, they may built, and although they were built separately be built as an integral part of the center section should that procedure be easier for you; breaking the "spars" at their proper points when dry and recementing the dihedral into them. An important point to be mentioned here is this; don't forget that both the leading and trailing edges taper. The leading edges may be cemented to the noses of the ribs as common rectangular stock and later trimmed to their proper cross sections.

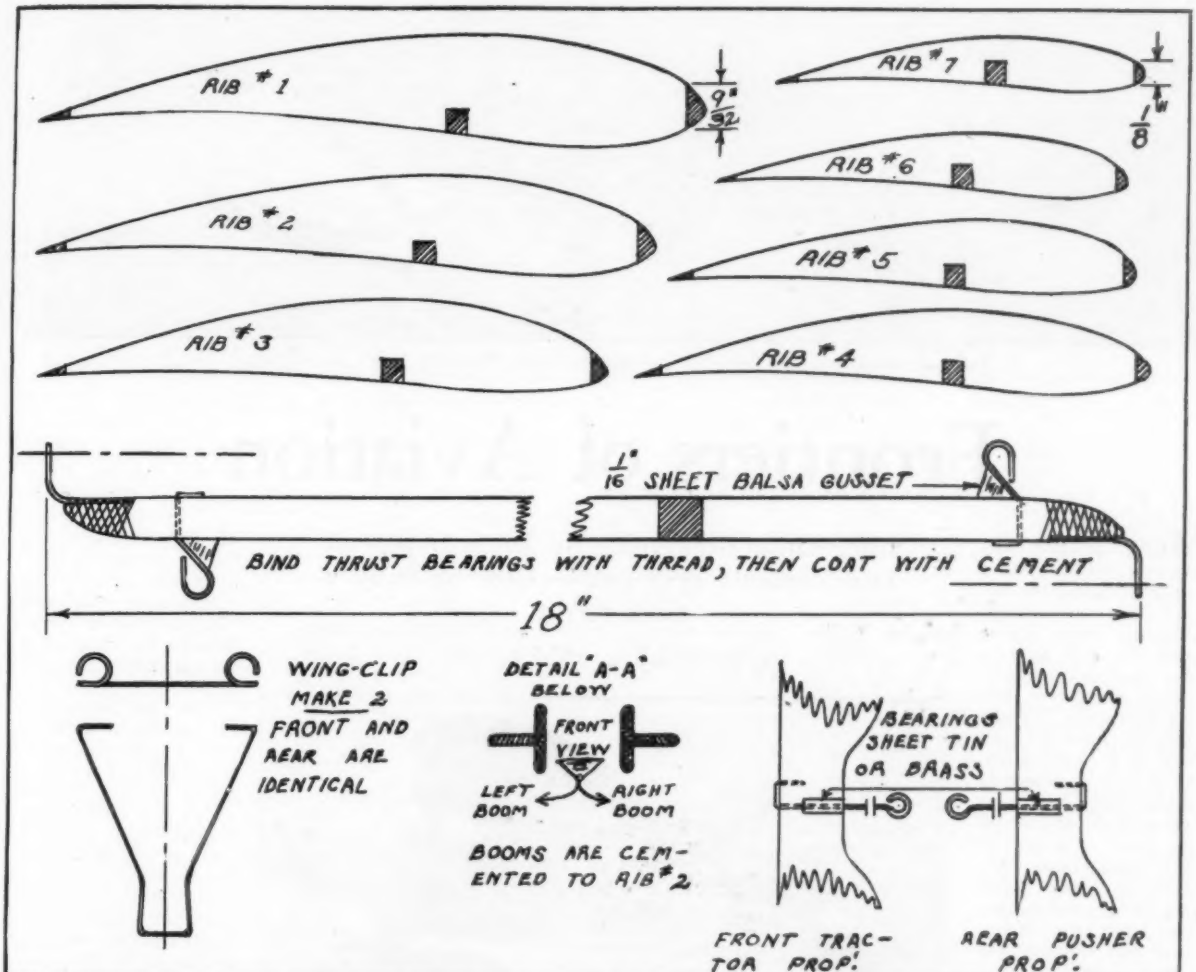
Wing tips are made from 1/16" reed and it may be formed by breathing on it, or soaking it in hot water for 15 minutes. Lastly the ⅛" sheet balsa wing-clip foundations are cemented into place to provide a location for the wing clips which are bent from 14 gauge piano wire. The wing can now be covered and this is best done by first covering the center section, and then the side panels. The original model was covered with red tissue such as can be purchased from almost any of the dealers that advertise in this magazine. To draw it taut, first apply water either with a spray gun or by very carefully rubbing the paper with a wet cloth. After the water has drawn the paper tight, apply either banana oil or thinned airplane dope, the latter being used on the original ship. Lastly cement the wing clips to the wing; one being fastened to the foundation heretofore mentioned and the other to the spar.



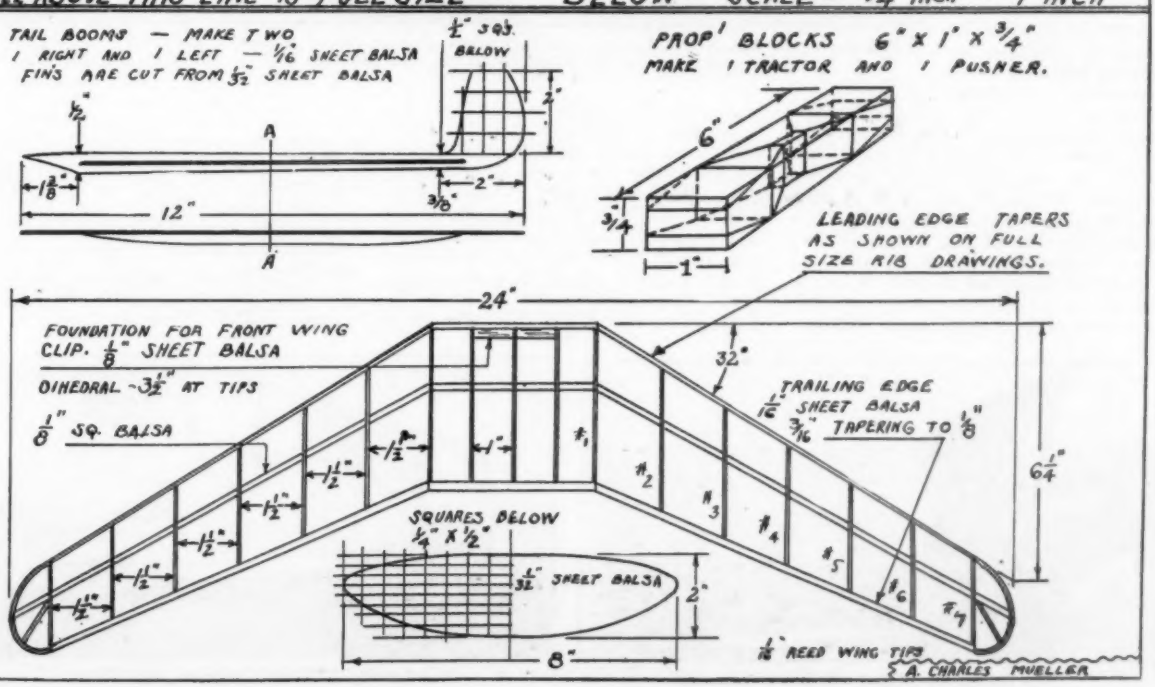
Tail Booms and Empennage

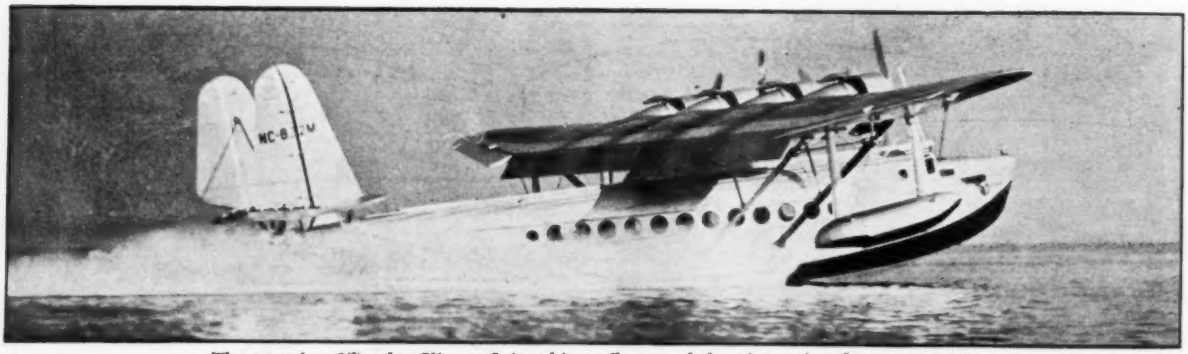
The booms are cut from hard 1/16" sheet balsa and they are strengthened with hard 1/16" balsa gusset longerons, cemented as shown on plans, thus making a "T" section. It is extremely important that you make sure you make one right and one left, when building these up. Now cut the rudders

(Continued on page 39)



ALL ABOVE THIS LINE IS FULL SIZE — BELOW - SCALE - 1/4 INCH = 1 INCH





The 3000 hp. Sikorsky Clipper S-42 taking off; one of the planes that flew to Hawaii

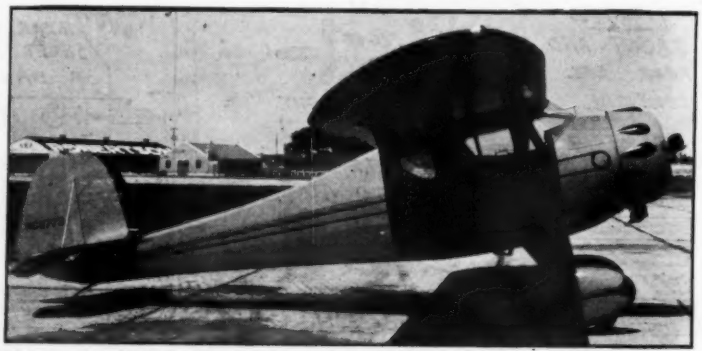
Frontiers of Aviation

Information Concerning the Latest Important Developments in Aircraft—How to Build a Scale P3Y-1

By ROBERT C. MORRISON

MOST aviation enthusiasts will remember the days when the diminutive Monocoupe with its Velie engine made its first appearance and became extremely popular in less than a fortnight. Though built solely for the purpose of a sport plane, the Monocoupe became famous as a race winner as well, and under the guiding hands of such prominent race pilots as Tony Little, Jack Wright and Johnny Livingston, the Monocoupe has probably won more races than any other single type of plane. But in spite of its great popularity the Monocoupe concern underwent many a reorganization, consolidating early in this stage with the Lambert engine manufacturers. Other models such as the Monocoach, Monoprep, and Monosport were built subsequently, but few were sold in comparison to the large number of Monocoupes purchased by fliers throughout the country, and later they were dropped from the production line.

However, now that aviation is on the upgrade, a well known figure in aeronautical circles, Clare Bunch, has purchased the Monocoupe interests and has announced a program that may once more bring the Monocoupe and its successors to the fore as the most popular and outstanding sport planes. After breaking the light plane altitude record in the latest of Monocoupes a few months ago, Clare Bunch announced that three newly designed planes were in production by his company, now known as the Lambert Aircraft Corp. Chief engineer is Mr. Mooney, who was made famous by his designing of the old Alexander Eaglerock "Bullets" and a similar plane of his own manufacture which bore his name.



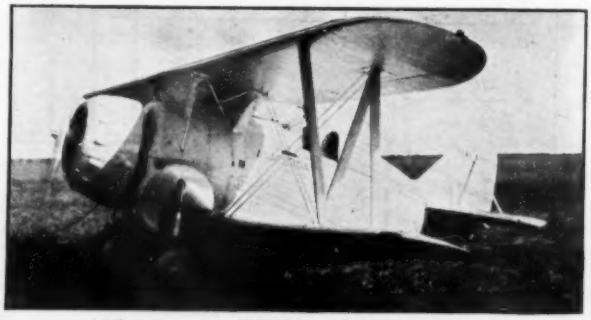
The latest model Monocoupe flown to the light plane altitude record recently by Clare Bunch, who has purchased the Monocoupe interests

The new planes will also have characteristics of the Mooney design with their full cantilever, thick, tapered wings and curved trailing and leading edges. Two of the planes will be low-wing single-engined ships, one open and one closed. The open model will be known as the Monoprep, the other the Monosport. Both will have side-by-side seating accommodations.

Both are for training use. Basic specifications of both follow

	Monoprep	*Monosport*
Weight empty	760 lbs.	950 lbs.
Payload	260 lbs.	260 lbs.
Gross weight	1355 lbs.	1545 lbs.
Wing span	29'-6"	29'-6"
Overall length	18'-6"	18'-6"
Overall height	6'-1"	6'-"
Power plant	90 hp. Lambert	same
High speed (est.)	125 m.p.h.	
Cruising speed (est)	105 m.p.h.	
Stalling speed	45 m.p.h.	Performance
Initial rate of climb	1040 ft./min.	slightly
Absolute ceiling	20,100 ft.	higher than
Service ceiling	18,200 ft.	Monoprep
Cruising range	590 miles	

The Grumman XGG-1 450 hp. commercial

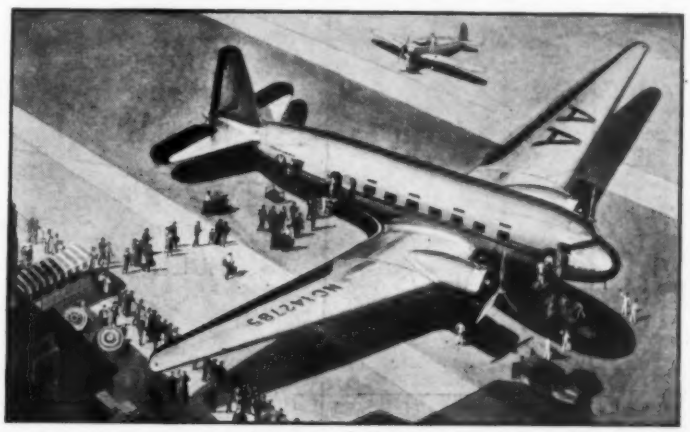


The Grumman XF2F-1 with 700 hp. Wasp

A new four motor Fokker transport of the Swedish Air Lines waiting to take off at Croyden, Eng.

We will publish more information on these two low-wing planes next month. Another new Lambert ship is the twin-engined Monocoach low-wing monoplane. This airplane will also be powered by Lambert R-266 90 hp. engines. It will have a top speed of about 170 m.p.h. and a cruising speed of 145 m.p.h. There will be accommodations for four people and 200 pounds of baggage. The present Lambert Deluxe 90 A will once more be known as the Monocoupe.

A plane that will give the Lambert trainers much competition is the new low-wing Aeronca described previously in this series. One of the first of these planes has now been delivered to Joe Plosser's noted flying school at Grand Central Air Terminal, Glendale, California. The little two-place cabin monoplane has a wonderful performance. However a slower landing speed might be obtained if flaps were employed. When the ship was first designed, a short landing gear was used so the wing would rest close to the ground, and thus it would give a "cushion" effect when coming in for a landing, giving the same results as flaps. It was found however when tests were made on the plane, that the stalling or landing angle had to be increased which necessitated the lengthening of the landing gear. The "cushion" effect is therefore not as effective, and the use of landing flaps may further decrease the landing speed of the plane. At present, landing speed is 45 m.p.h. Top speed with a 70 hp. LeBlond is 112 m.p.h.; cruising 103 m.p.h. With a 90 hp. Lambert engine a top of 125 m.p.h. or more may be obtained. Span is 36', length 22'. An N.A.C.A. 2412 airfoil is used. Ailerons operate 35 degrees upwards and 15 degrees downwards. A tab is employed on elevator. The wooden wing is of one single piece and goes right through the welded steel tubing fuselage. The Aeronca has a gross weight of 1500 lb. and carries 25 gal. of fuel and 60 lb. of baggage. With brakes as standard equipment, its price is approximately $2,500. This plane should become very popular.



How the 2000 hp. Douglas Airliner will look at the airport while taking on passengers, as pictured by the artist

It has been rumored that Harris M. Hanshue, former airline executive, is collaborating with Col. Charles A. Lindbergh on the design of a new low-priced sport plane which they are to manufacture. If such information is correct, such a plane bearing Col. Lindbergh's name should become as popular as Ford cars.

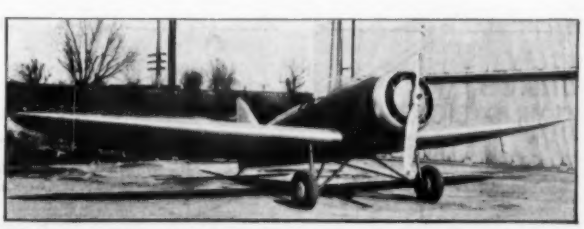
In contrast to the small light sport planes are the proposed giant flying boats that are steadily but carefully being designed for trans-oceanic use. It is this writer's opinion that the Consolidated Aircraft Corp., may soon come forth with a flying boat for Pan American Airways.

The engineering department of Sikorsky Aircraft is busily engaged in the design of two new flying ocean liners. One is the huge Sikorsky described in past issues of MODEL AIRPLANE NEWS, and this ship may have a gross weight as high as 125,000 pounds. The other is an intermittent size between the present S-42 and the above-mentioned plane. It will weigh 80,000 pounds when fully loaded, which is almost ten tons more than the present Martin "Clippers." Mr. Sikorsky believes that the future flying boats should cruise from 150 to 250 m.p.h. and they will carry a crew of about 12 or 13.

In the manufacturing section of Sikorsky Aircraft, twenty-one S-43s are now on order and under construction and also six S-42s.

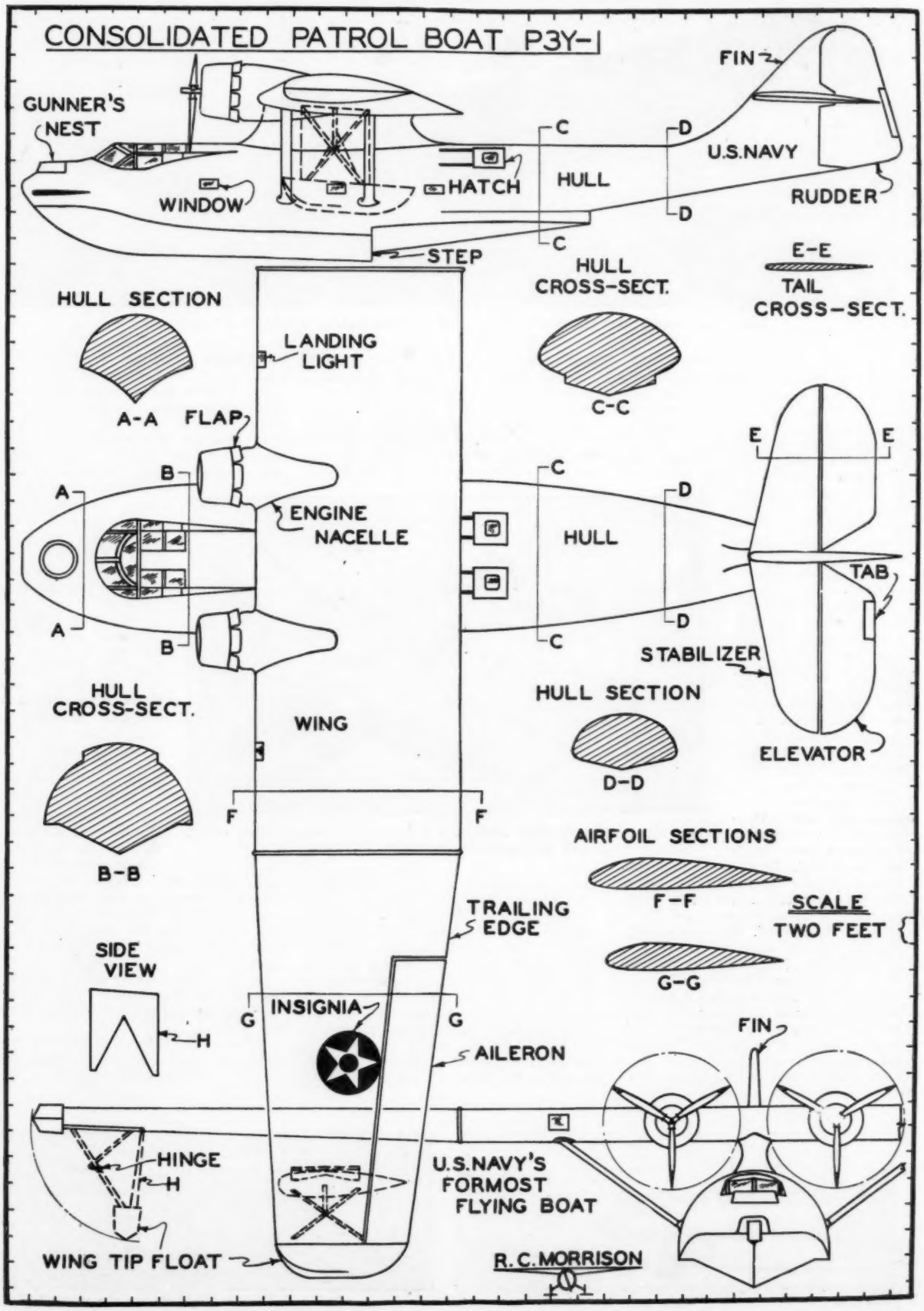
Fifteen new Stinson Model "A" low-wing tri-engined monoplanes have been

(Continued on page 37)



The new Lambert low-wing Monoprep. It cruises at 103 m.p.h. with a 90 hp. Lambert engine

A two-seater Russian glider in flight during the unusual glider contest in Russia (Sovfoto)


CONSOLIDATED PATROL BOAT P3Y-1
FIN
GUNNER'S NEST
C
D
U.S.NAVY
HATCH
HULL
WINDOW
RUDDER
D
C
STEP
E-E
HULL CROSS-SECT.
TAIL CROSS-SECT.
HULL SECTION
LANDING LIGHT
C-C
A-A
FLAP
E
E
B
C
A
ENGINE NACELLE
HULL
D
TAB
A
D
B
C
STABILIZER
HULL CROSS-SECT.
WING
HULL SECTION
ELEVATOR
D-D
F
F
AIRFOIL SECTIONS
B-B
F-F
SCALE
TWO FEET
TRAILING EDGE
SIDE VIEW
G-G
G
INSIGNIA
G
FIN
H
AILERON
HINGE
H
U.S.NAVY'S FORMOST FLYING BOAT
WING TIP FLOAT
R.C.MORRISON

Vital Facts of Model Design

Chapter No. 5 **Article No. 48**

How to Arrange Structural Weights to Promote Stability—Structural Model Types That Are Commonly Used

By CHARLES HAMPSON GRANT

IN ARTICLE No. 47 of this series which appeared in the February issue of MODEL AIRPLANE NEWS, a discussion of the procedure of design was started. It was shown why stability is the most important factor to build into your planes, and how to proceed first with the proper arrangement of the aerodynamic forces acting on the model in flight in order to attain stability or any other type of performance that you might desire.

Eight important factors were considered. There is one more which influences the stability of a model to a large extent; namely *the arrangement of the individual weights of the structure of the model.* The closer these weights can be located to the center of gravity, the more stable the plane will be. It will recover more quickly from any dangerous flight attitude. This means that the parts of the structure such as the tail unit, the propeller and the wing tips, should be as *light* as possible and as near to the center of gravity as possible. They can be made light by suitable types of construction but a certain amount of distance from the C.G. is required on the other hand, for; (1) reasons of effectiveness as in the case of the tail surfaces; (2) for efficiency reasons, the wing span for instance, or, (3) because of structural demands, that often make it necessary to have a long nose on the model for correct balance. The problem of design in this case is to keep the nose short, the span within reason and the weights of the remote parts as light as possible without reducing the model's efficiency or stability. This is a large order, but in the accuracy of judgment and ingenuity used regarding the arrangement of these factors, lies the art of design.

There is no definite rule that will cover all cases. Experience is the only thing which enables you to sense the correct proportions in any particular case. Following the general rules given here, however, will insure a correct approach to the problem.

As the model to be designed now is to be stable beyond anything else, it should have the following characteristics in regard to the distribution of individual weights.

First, the tail surfaces should be made as light as possible. Though it would be helpful as far as this ninth factor is concerned to have a short moment arm, other requirements of stability prohibit it. Also the tail surfaces must be of sufficient *size.* The stabilizer area should be about 1/3 the wing area and the fin area about 1/9 the wing area (for rubber powered models).

Second, the propeller should be light, if compatable with correct plane balance, and the nose of the fuselage should be short, the C. G. coming as close to the front end of the machine as possible.

Third, the wing span should not be excessive; not more than seven times the chord at the most. An aspect ratio of six would be even more advisable.

An excellent example of reducing the tail weights to a minimum exists in cases where tail "booms" are used. The motor stick is usually comparatively short, the necessary tail moment arm being obtained by cementing a very light stick or tube to the rear end of the motor stick so that it extends rearward for the distance required to make the moment arm sufficiently large. The tail surfaces are cemented to the end of the boom. Thus the extreme rear structure of the model is very light and does not generate much swinging moment.

The distance from the center of gravity to the propeller at the nose of the model can be kept small by the use of a heavy landing gear and wheels, attached to the extreme forward end of the body frame or fuselage. Any other means of weighting the nose would produce this condition. Usually, weighting the nose shortens the part of the model ahead of the C. G. to such an extent that the added weight of the nose is so close to the C. G. that it does not create large swinging moments.

The swinging moments due to the weight of each wing being located some distance out from the center of gravity, may be kept at a minimum in three ways.

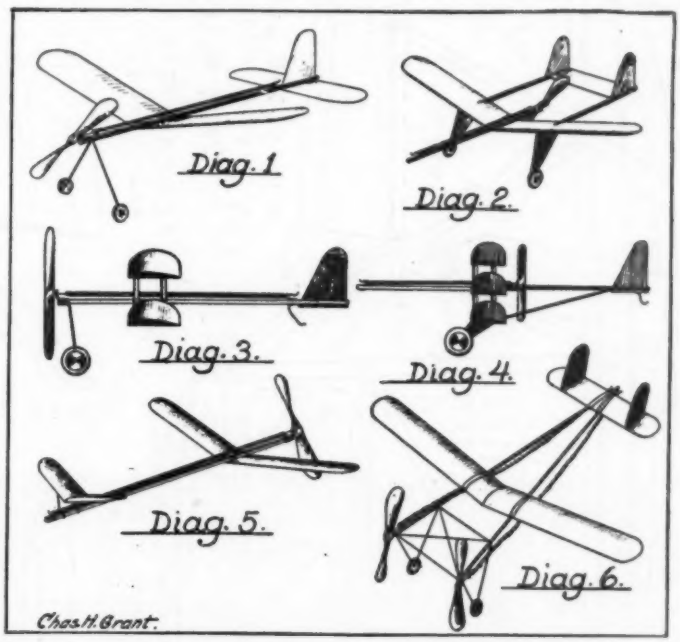
First, the span can be kept small.

Second, the structure of the wing ends can be lighter than the center portions.

Third, the wings can be of the tapered type; large chord at the center and growing smaller from center to wing tip.

Keeping weights of the remote parts down to a minimum in this way increases stability or allows the tail surfaces to be made smaller than otherwise would be required and yet retain the stability.

The use of a tail boom, tapered wings and a heavy landing gear and wheels should be kept in mind when the definite proportions and physical characteristics of our *"stable"* model are established later.



Choice of Structural Type

Now that we have a definite idea concerning the correct arrangement of the aerodynamic forces for a stable model, it is required that we design a mechanical structure that will *produce* the necessary flight forces in the relative arrangement outlined in the preceding discussion.

As it was stated in article No. 1 of this series, the structure of the model must be composed of several units which will produce these forces. First there must be a means of lift. A plane surface or wing, or a series of them, placed in the correct position and attitude to the line of thrust will generate the *lift* for our model when it is in flight. Then there must be a source of power and a means of transforming the power into thrust or a driving force. A rubber motor will deliver the power to a propeller and the propeller will then produce the driving force when it revolves about its axis. When the wing is properly mounted on the model relative to the line of thrust, the speed of the model forward, caused by the thrust of the propeller, enables the wing to produce the necessary lift.

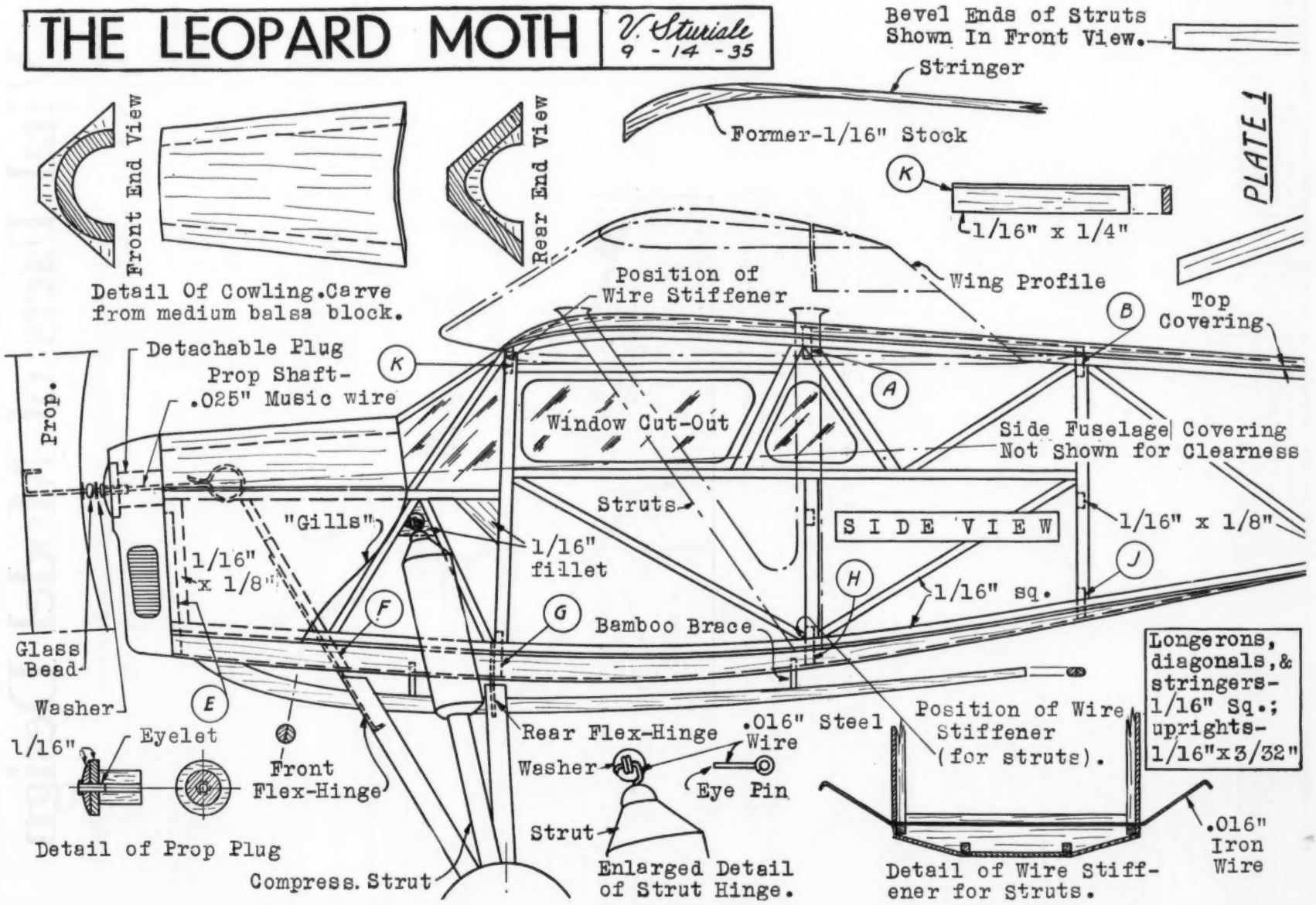
Third, the tail surfaces in conjunction with the correct arrangement of weights of structural parts create the stability required in order to have the model remain in flight.

(Continued on page 44)

THE LEOPARD MOTH

V. Stuviale
9 - 14 - 35

PLATE 1



A Flying Scale "Leopard Moth"

Complete Drawings and Instructions Which Will Enable You to Build an Unusually Fine Flyer. A Model of England's "Most Popular" Sport Plane

The finished model looks and acts like the full size plane

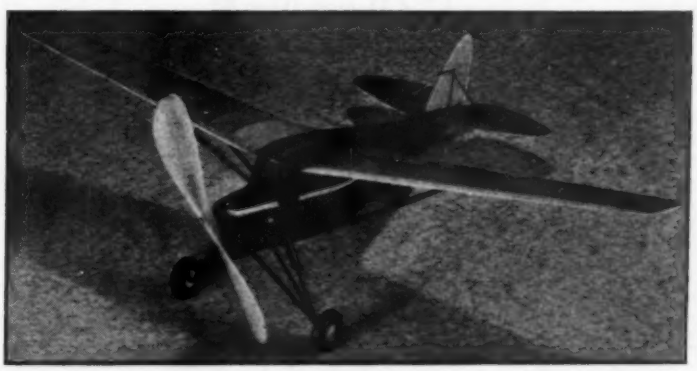
By VIRGIL STURIALE

THE D. H. 85 "Leopard Moth" is the latest addition to the De Havilland series. Having the famous "Puss Moth" as a foundation, the rightful successor has won the hearts of all English flying sportsmen, and its excellent design, construction and performance, have placed it in the class of internationally popular aircraft.

Its clean, flowing lines and excellent aerodynamic design, make possible a replica possessing outstanding performance. The model is built to the 5/8" scale and is in exact proportion with its prototype, with the exception of a slight increase in tail surface area, and landing gear height, both changes being essential for a good flying model.

The fuselage is completely covered with 1/32" sheet balsa veneer, which simulates the all-wood fuselage of its "big brother," and at the same time provides for a more rigid construction. There are shock-absorbers on the landing gear which absorb all the impacts such a model must take. All control surfaces are movable to increase the adjustment range.

Your efforts will be well rewarded with a presentable and good performing model.



A graceful ship boasting shock absorbers, minor details and a large propeller for long flights

Build up two fuselage sides of 1/16" square balsa as per drawing. Cement in all fillets to the various intersections as shown. Next, apply the side covering respectively to side frame. This covering material is 1/32" sheet balsa veneer. If the required width cannot be obtained, standard 2" sheets will have to be butted and cemented together. Cement covering securely to side, its contour conforming exactly to outline of frame. Side windows are cut out as per drawing, using sharpened ferrules to obtain corner arcs. Cut out all required formers from 1/16" balsa. Bulkhead (D) is cut from 3/32" sheet and rear hook, bent to shape from .025" steel wire, is cemented in place as shown to (D). All formers and bulkheads are then cemented in their respective stations, making sure that the top fuselage curve is symmetric.

Next, cement in all stringers of 1/16" square balsa. Cut top stringer former piece as per detail and cement in place, then when dry, sand smoothly to shape. Braces of 1/16" x 1/8", to keep large sections of fuselage rigid, are cemented in positions shown. Cut celluloid window covering to shape and cement to back of window cut-outs. Form wing spar wire-stiffener to shape from .016" steel wire and cement in place. Same proceedings are followed for strut wire-stiffener.

Top covering is cut roughly to shape, windows cut out as shown, and cemented securely in place. Bottom covering is made up of four pieces of veneer. The section aft of (J) is covered in one piece; forward of (J), in three pieces. Details clearly show method of lapping panels. Where covering angle is acute, such as between sections E, F, G, etc., it becomes necessary to cement "filler" pieces of scrap balsa to form a glue base for side panel. Cover top windows on the inside with celluloid. Refer to plan details and shape tail block. Next, pieces (M) are shaped as shown from 1/16" sheet and cemented securely in place. Former (L) of 1/32" stock is shaped, then cemented over (M) and to tail block. Fuselage covering is doped several times and sanded after each application to obtain a smooth finish. The fuselage may be covered with tissue. The latter application is doped and sanded smoothly. Cement brass reinforcement washers to sides of fuselage as shown. These washers are used to strengthen fuselage sides from being injured by the compression strut. Refer to plan detail, form strut eye-pin, bind with thread and cement in position as shown. Front and rear flexhinges for landing gear struts, are made as per drawing and cemented in place to formers (F) and (G) respectively.

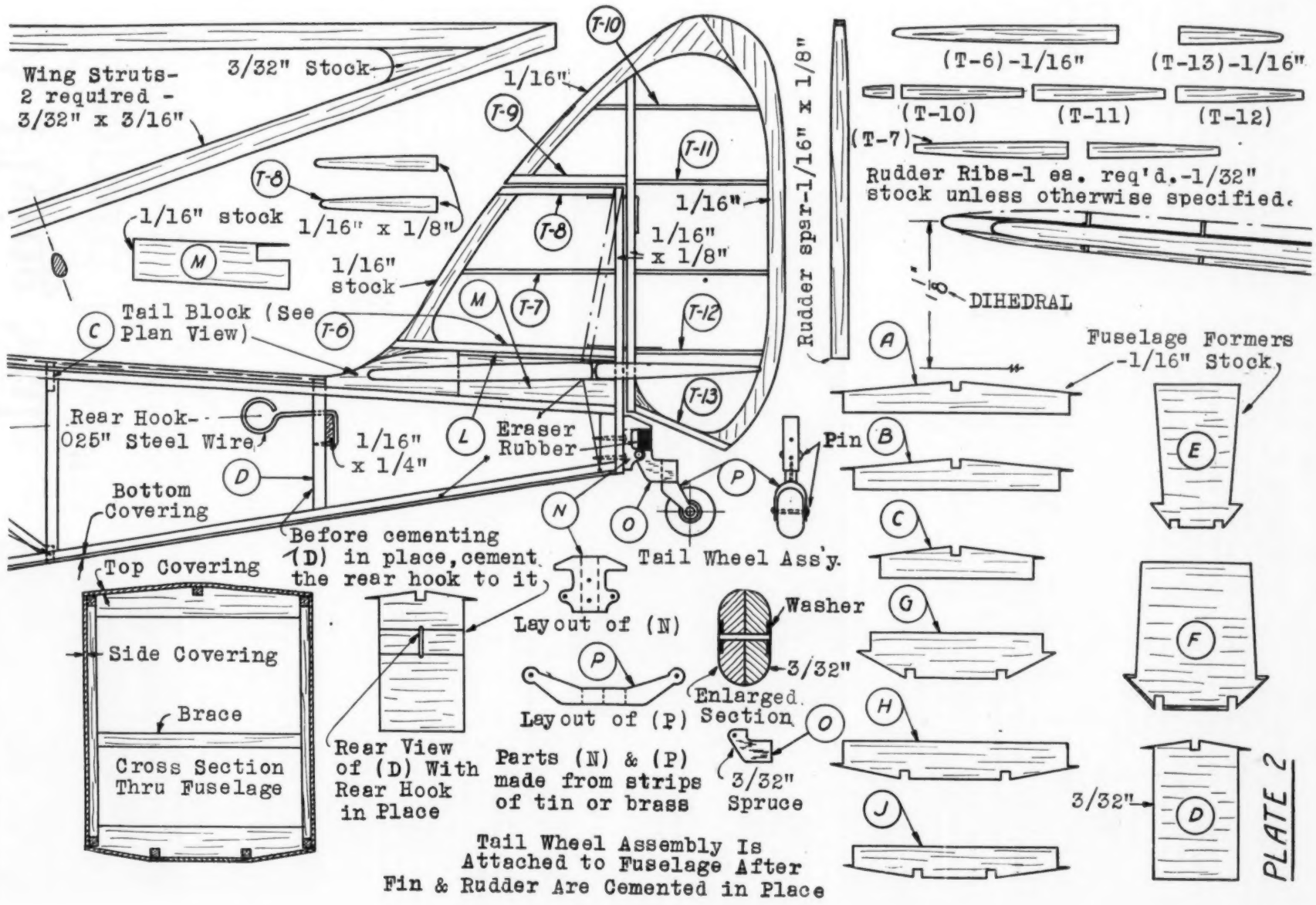
Refer to plan and assemble landing gear struts, from very hard balsa, then sand to a streamlined section. They are then cemented to front and rear flexhinges. Refer to plan details and assemble compression struts. Strut hinge is bent to shape from .016" steel wire, wrapped with thread, and cemented to top of strut. Lower end of strut is beveled and completed unit cemented to landing gear strut and attached to side of fuselage. Bend axle to shape as shown from .025" steel wire, cement in place, and bind neatly with fine silk thread.

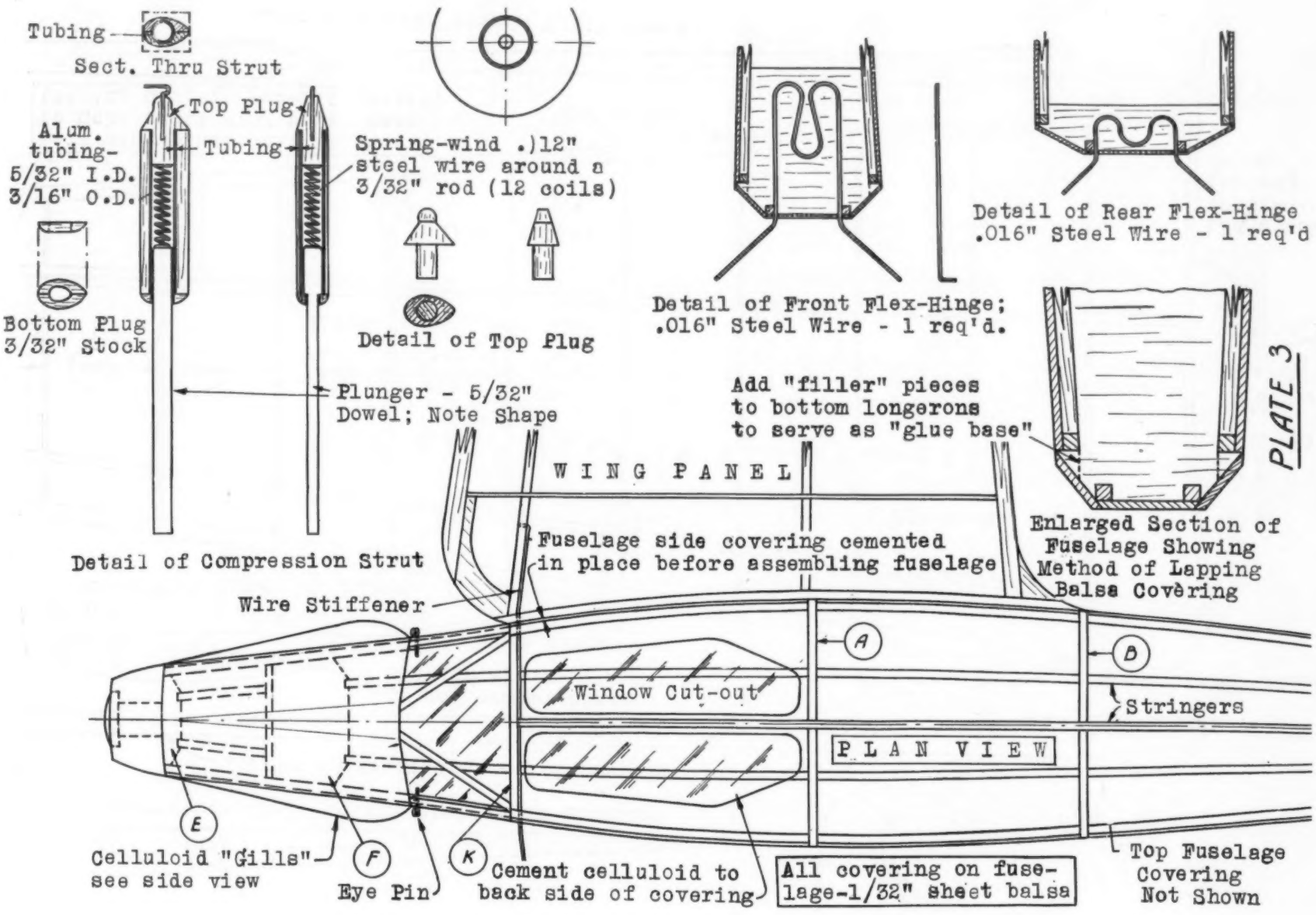
Cowling is cut to shape from hard balsa, hollowed out and cemented in place. Refer to front and rear view and shape nose piece as shown. It is built in two pieces, for in this way the plug hole may be easily cut out. A cylindrical recess into which outer portion of prop plug must fit, is cut in nose piece. Refer to plan and build up wind shield frame of 1/16" dowel, then cover each section with celluloid. Dope cowl and nose piece several times, sanding between each application. Propeller plug is built as shown by plan details of hard wood or hard balsa. A small eyelet is cemented in place in center hole of plug, serving as the propeller bushing. Exhaust pipe is made by cementing two formers, (shown on side view) of 1/16" balsa together, then sanding as per sections shown on plan. Cement small bamboo braces, also shown on side view, then cement exhaust pipe in position to fuselage and braces.

Wing Construction

Cut 22 ribs as per template from 1/32" sheet balsa and 2 from 1/16" sheet. First, cut front and rear spars and aileron spars from 1/16" balsa as per layouts. Leading edge is cut from 1/8" stock, tapering from 1/4" at rib R-2, to 5/32" at rib R-12. The wing is constructed in the usual manner with the exception that the spars are "sunk-in" the ribs, thus, it becomes necessary to elevate spars to the proper height in assembling panels. To hold ribs and spars in place, set up a temporary "jig" of small wood blocks, to insure perfect alignment of all parts of structure. Note that rib R-6 is cut away at spar points. In that formed recess,

(Continued on page 46)


Wing Struts- 2 required - 3/32" x 3/16"
3/32" Stock
1/16" stock
1/16" x 1/8"
1/16" stock
Tail Block (See Plan View)
Rear Hook-- .025" Steel Wire
1/16" x 1/4"
Bottom Covering
Top Covering
Side Covering
Brace
Cross Section Thru Fuselage
Before cementing (D) in place, cement the rear hook to it
Rear View of (D) With Rear Hook in Place
Eraser Rubber
Tail Wheel Ass'y.
Pin
Layout of (N)
Layout of (P)
Washer
3/32"
Enlarged Section
Parts (N) & (P) made from strips of tin or brass
3/32" Spruce
Tail Wheel Assembly Is Attached to Fuselage After Fin & Rudder Are Cemented in Place
Rudder spar-1/16" x 1/8"
1/16"
1/16" x 1/8"
(T-6)-1/16"
(T-13)-1/16"
(T-10)
(T-11)
(T-12)
(T-7)
Rudder Ribs-1 ea. req'd.-1/32" stock unless otherwise specified.
1/8" DIHEDRAL
Fuselage Formers -1/16" Stock
3/32"
PLATE 2


Tubing
Sect. Thru Strut
Top Plug
Tubing
Alum. tubing- 5/32" I.D. 3/16" O.D.
Bottom Plug 3/32" Stock
Spring-wind .)12" steel wire around a 3/32" rod (12 coils)
Detail of Top Plug
Plunger - 5/32" Dowel; Note Shape
Detail of Compression Strut
Detail of Front Flex-Hinge; .016" Steel Wire - 1 req'd.
Detail of Rear Flex-Hinge .016" Steel Wire - 1 req'd
Add "filler" pieces to bottom longerons to serve as "glue base"
WING PANEL
Fuselage side covering cemented in place before assembling fuselage
Wire Stiffener
Enlarged Section of Fuselage Showing Method of Lapping Balsa Covering
PLATE 3
A
B
Window Cut-out
Stringers
PLAN VIEW
E
F
K
Celluloid "Gills" see side view
Eye Pin
Cement celluloid to back side of covering
All covering on fuselage-1/32" sheet balsa
Top Fuselage Covering Not Shown

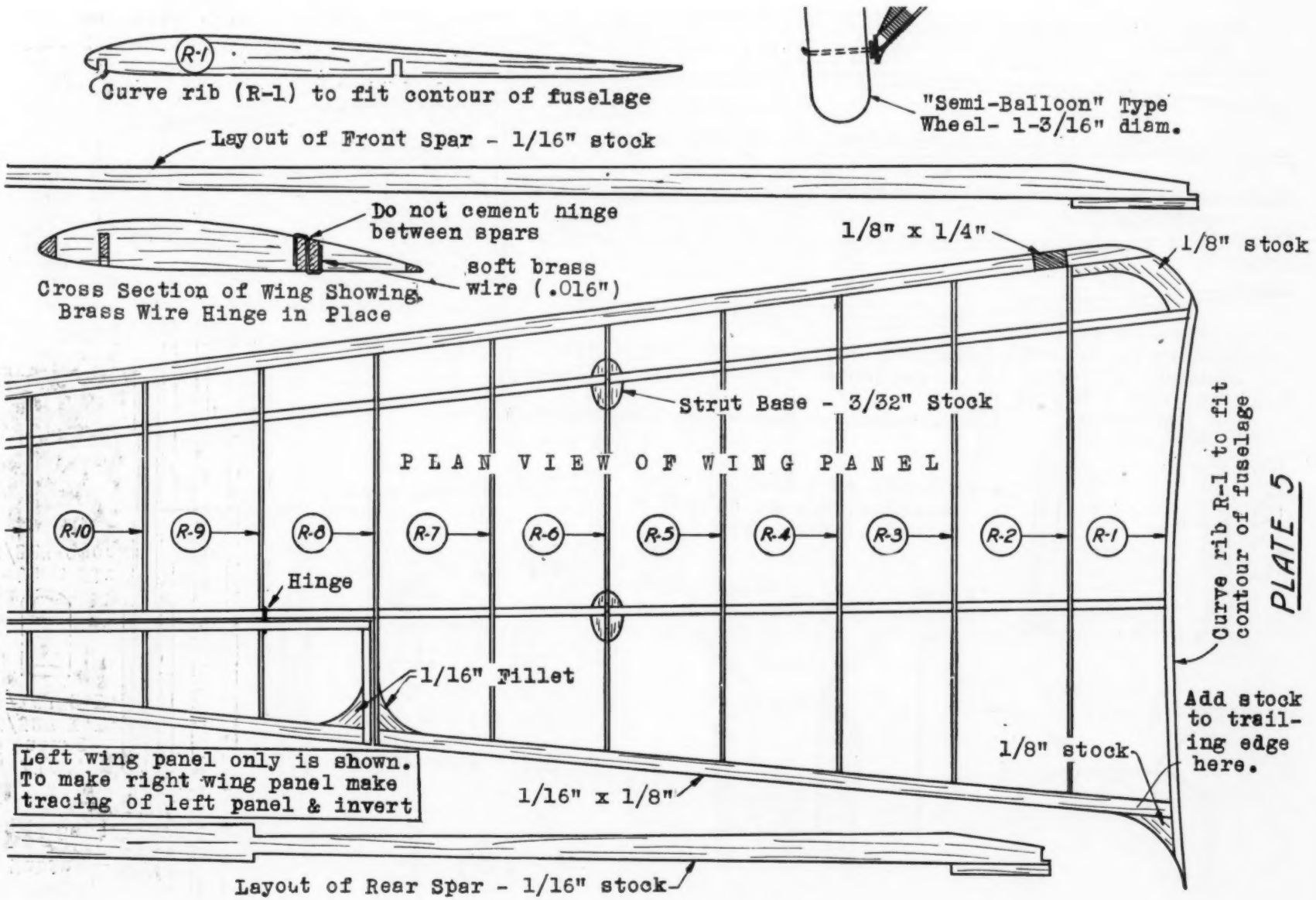
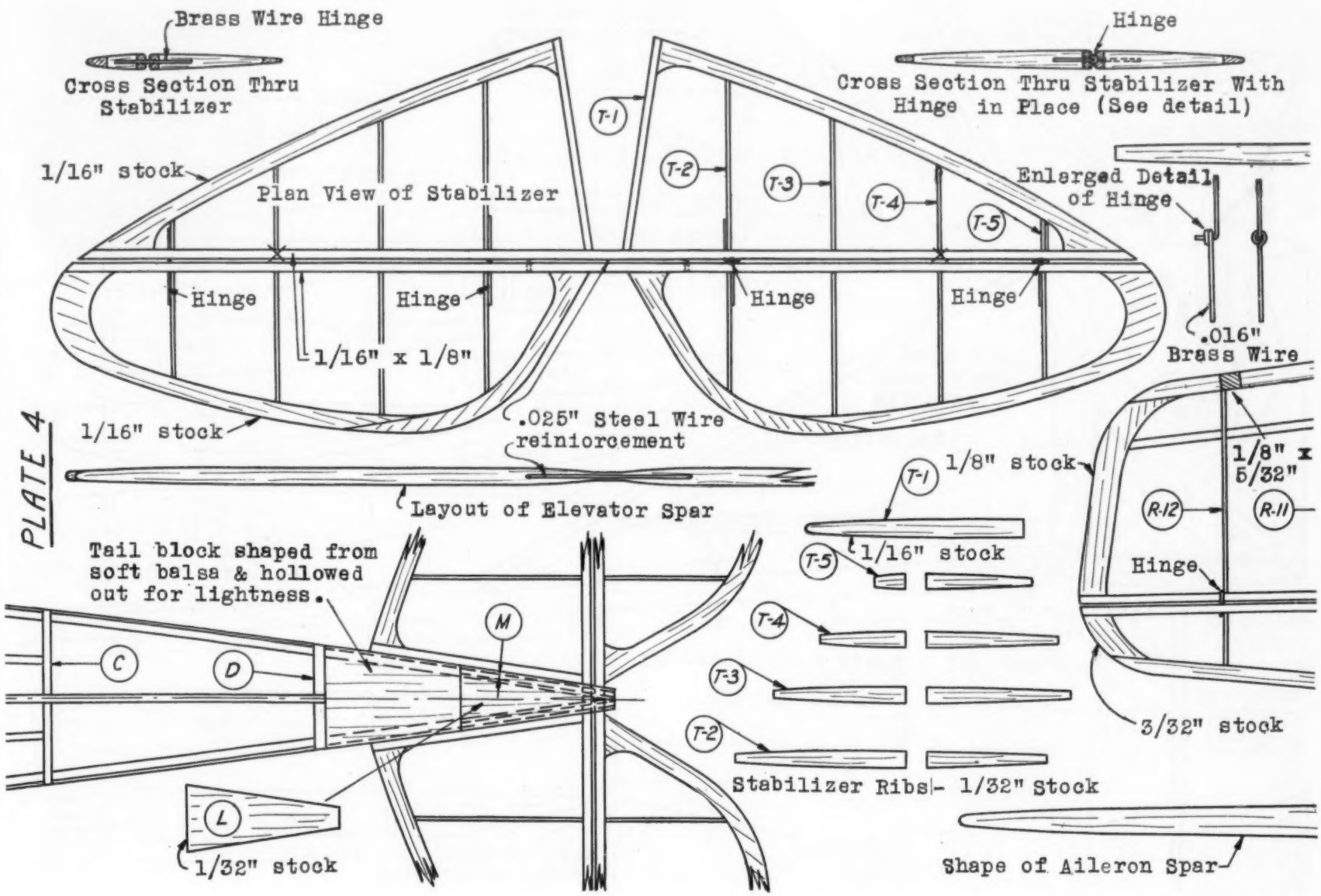

R-1
Curve rib (R-1) to fit contour of fuselage
"Semi-Balloon" Type Wheel- 1-3/16" diam.
Layout of Front Spar - 1/16" stock
Do not cement hinge between spars
soft brass wire (.016")
Cross Section of Wing Showing Brass Wire Hinge in Place
1/8" x 1/4"
1/8" stock
Strut Base - 3/32" Stock
PLAN VIEW OF WING PANEL
R-10
R-9
R-8
R-7
R-6
R-5
R-4
R-3
R-2
R-1
Hinge
1/16" Fillet
Curve rib R-1 to fit contour of fuselage
Add stock to trailing edge here.
1/8" stock
Left wing panel only is shown. To make right wing panel make tracing of left panel & invert
1/16" x 1/8"
Layout of Rear Spar - 1/16" stock

PLATE 5

PLATE 4


Brass Wire Hinge
Cross Section Thru Stabilizer
Hinge
Cross Section Thru Stabilizer With Hinge in Place (See detail)
1/16" stock
Plan View of Stabilizer
T-1
T-2
T-3
T-4
T-5
Hinge
Hinge
Hinge
Hinge
1/16" x 1/8"
Enlarged Detail of Hinge
.016" Brass Wire
1/16" stock
.025" Steel Wire reinforcement
Layout of Elevator Spar
T-1
1/8" stock
1/8" x 5/32"
R-12
R-11
T-5
1/16" stock
Hinge
Tail block shaped from soft balsa & hollowed out for lightness.
M
C
D
T-4
T-3
T-2
3/32" stock
Stabilizer Ribs - 1/32" Stock
L
1/32" stock
Shape of Aileron Spar

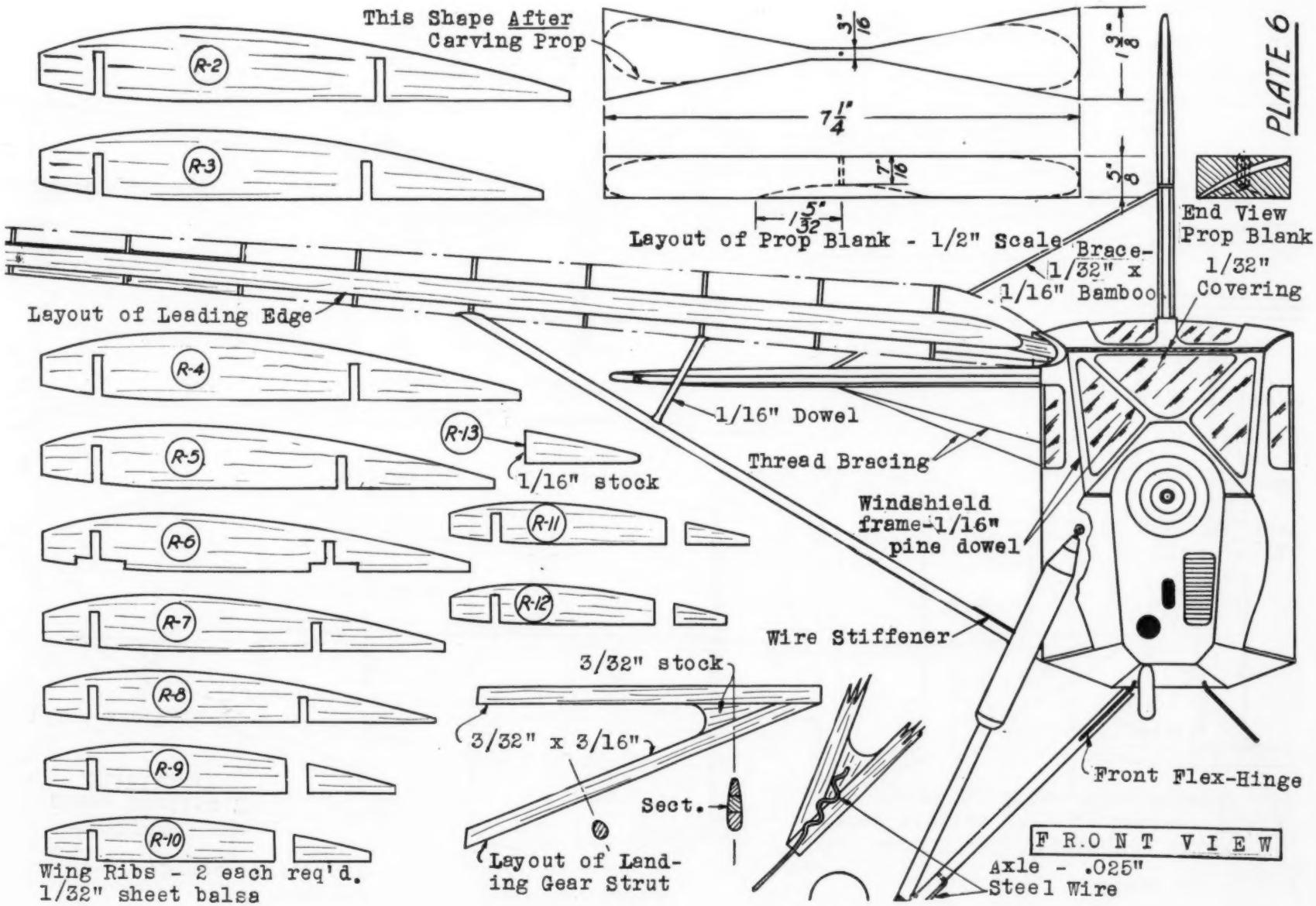
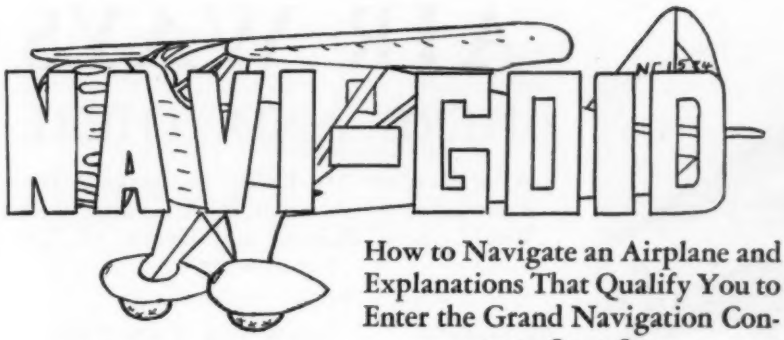


PLATE 6
This Shape After Carving Prop
3"/16
1 3/8"
7 1/4"
7"/16
5"/8
5"/32
Layout of Prop Blank - 1/2" Scale
End View Prop Blank
1/32" Covering
Brace-1/32" x 1/16" Bamboo
Layout of Leading Edge
R-2
R-3
R-4
R-5
R-6
R-7
R-8
R-9
R-10
R-13
1/16" stock
R-11
R-12
1/16" Dowel
Thread Bracing
Windshield frame-1/16" pine dowel
Wire Stiffener
3/32" stock
3/32" x 3/16"
Sect.
Layout of Landing Gear Strut
Front Flex-Hinge
FRONT VIEW
Axle - .025" Steel Wire
Wing Ribs - 2 each req'd. 1/32" sheet balsa



How to Navigate an Airplane and Explanations That Qualify You to Enter the Grand Navigation Contest to Start Soon

By E. SEMLER

"JJ"

Author's Note:

This is the second of three articles designated to familiarize the reader with the instruments and the correct aerial navigation procedure necessary to arrive at the solution of each NAVI-GOID, a contest which will commence in two months. May I suggest that you preserve these three articles for reference during the contest activities as you will find them the simplest guide available.

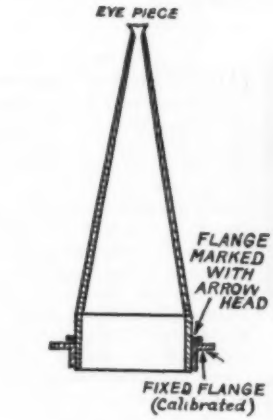
Article I gave ten cardinal points to be taken into consideration:

1. TIME. 2. ALTITUDE. 3. AIRSPEED. 4. GROUNDSPEED. 5. DRIFT. 6. DEVIATION. 7. VARIATION. 8. WHETHER YOU WERE USING A CHART OR A MAP. 9. TRUE SCALE OF MILES. 10. MAGNETIC COMPASS READING.

"WE HAVE covered *time* and *altitude,*" Captain Nicholas Carroll continued, "Now we come to *airspeed.* We have an instrument called an *Airspeed Indicator* that shows just what our airspeed is. (Refer to vocabulary: Airspeed) However, you must remember that the airspeed indicator is constructed for a true reading at sea level. At higher altitudes, where the air is more rarified, the same airflow will have a slightly reduced effect on the diaphragm of the instrument. Allowance has been made for this and we find it necessary to add one and three-quarters per cent (1¾%) to the airspeed *shown on the dial* for every 1,000 feet of altitude.

"Therefore, if the NAVI-GOID speaks of an airspeed of 100 m.p.h. and the altitude is 1,000 feet, then the true airspeed would be 101¾ m.p.h. Similarly, if the airspeed indicator read 210 m.p.h. and the Altimeter read 10,000 feet, the true airspeed would be 246.75 m.p.h. or, more favorably, 247 m.p.h. For your calculations, the correct form of multiplication for 1¾% is .0175.

"Still with me," the Captain inquired.



"BB"
DRIFT INDICATOR

Charles Montgomery looked up. The open page of his notebok was black with notes. "Oh, yes sir," he answered hastily.

Carroll sat a moment in speculation, then went on. "By *true airspeed* I do not mean *actual airspeed. True airspeed* is actual *only* when there is no wind flowing from ahead or from astern. If the *true airspeed* is 246.75 m.p.h. and there is a *tailwind* of 20 m.p.h., the *actual airspeed* would be 266.75 m.p.h. If it were a *headwind* instead of a *tailwind,* the 20 m.p.h. wind would retard the progress of the plane and therefore must be subtracted from the true airspeed. In that case, the *actual airspeed* of the example would be 226.75 m.p.h. Remember, *headwinds* must be *subtracted,* and *tailwinds added.*

210 equals AIRSPEED INDICATOR READING.

1¾x210 equals 1,000 FEET ALTITUDE.

10x1¾x210 equals 10,000 FEET ALTITUDE.

10x.0175 equals .175.

.175x210 equals 36.75.

36.75+210 equals 246.75 TRUE AIRSPEED.

20 m.p.h. equals TAILWIND.

246.75+20 equals 266.75 ACTUAL AIRSPEED.

"Now we come to *groundspeed.* It is relatively easy to determine the groundspeed due to the fact that the instrument in figure 'BB' gives the correct reading. This instrument is really a drift indicator, but it has been found that, at a certain altitude, when a landmark passes down the wire 'P,' the groundspeed can be determined by the length of time it takes the landmark to pass from 'N' to 'M.'

"So, to find his groundspeed, a pilot can rise until his altimeter reads a certain height, have his navigator note the time it takes for the landmark to pass down 'P' from 'N' to 'M', and thus work out his groundspeed. Then, *the difference between his groundspeed and his true airspeed is the speed of the wind.* (If the wind is from astern or ahead.)

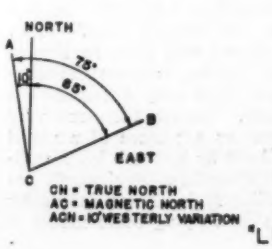
GROUNDSPEED equals AIRSPEED INDICATOR READING x 1¾% PER 1,000 FEET ALTITUDE+WIND.

or... GROUNDSPEED equals TRUE AIRSPEED+WIND.

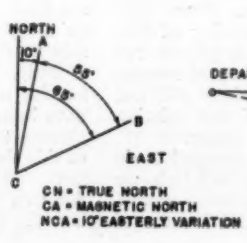
or... GROUNDSPEED equals ACTUAL AIRSPEED.

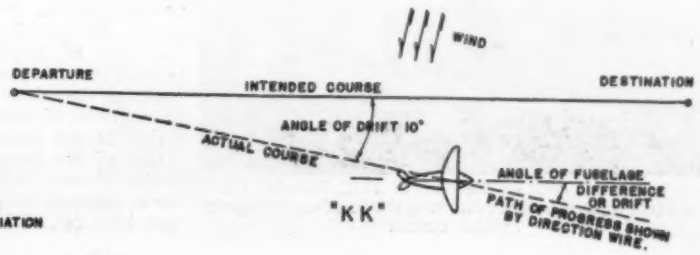
"Next, we come to *Drift.* Drift is caused by a wind quartering, or blowing from the side, and thus blowing the plane from its intended course. (Figure 'KK') The angle of drift must be known to find an accurate

(Continued on page 36)



"LL"





"KK"

The Vought Corsair SBU-1, by Earl Eberhart

AIR WAYS
HERE AND THERE

What Readers Are Doing to Increase Their Knowledge of Aviation in All Parts of the World. Send Pictures and Details of Your Experiments

Pict. No. 1. This unusually neat flying scale model of the Lockheed Electra was built by Edward Radtke. It actually exudes fine workmanship

Pict. No. 4. A Hawk F11C-2 that took Peterson 250 hours to build

Pict. No. 3. Much has been heard about the Flying Flea. Here is a flying scale model of it by Ken. Hamilton

Pict. No. 5. Back in the days of 1911, boys of Tufts College built this glider and won the first Intercollegiate glider contest

BEFORE telling you about the interesting models pictured in Air Ways columns this month, we wish to call to your attention the coupon which appears at the end of Air Ways. All model builders who wish to belong to the Air Ways Club for Model Airplane Builders, fill in the coupon and mail it to the editor of MODEL AIRPLANE NEWS, 551 Fifth Avenue, New York City. This club will be sponsored by MODEL AIRPLANE NEWS and news of the club will be furnished each month. Data on the formation of units, outlines for instruction in model building and for creating interest within the organization of any particular unit, will be available to club members shortly. The object of the club is to promote aviation, especially of the model variety and to help our club members to acquire a complete knowledge of aviation matters. Club members may look forward to club contests with a national contest held each year. Rules governing flights under the Model Club's sponsorship will soon be available. If any model fans have any ideas as to what they feel these rules should include and how the club should be conducted, write into the Air Ways Club. We wish this organization to be "the" model builders' club, one which will be helpful to every member and to which anyone would be proud to belong.

Earl Eberhart of 1502 Batchelor Street, Miles City, Montana, sends us a very fine drawing of a Corsair SBU-1. It appears as the heading of Air Ways this month. The number of fine drawings of airplanes received during the past months indicates that there will not be a dearth of fine aviation artists in the future.

One of the unusual scale model pictures which we have received this month, was built by Ed Radtke of

HOW YOU CAN JOIN THE AIR WAYS CLUB

3731 North 24th Place, Milwaukee, Wisconsin. This model is shown in picture No. 1. This is not only a scale model but a flying scale model of the Lockheed Electra. It lacks much of the complication and therefore the general appearance of a flying scale model. However, this lack of complication is due to the clean streamlined design of the ship. The workmanship is exceedingly fine, as you will note from the picture.

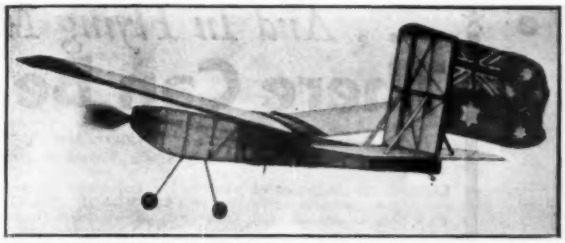
The ship is built to a ¾" scale. It was designed with a low center of gravity and is very stable. Both propellers are connected to a rubber motor in the fuselage by connecting rods, which work on crankshafts. The transmission is all inside the wing. One feature is that the propellers revolve in opposite directions.

Picture No. 2 shows a six foot glider, built by Elbert J. Weathers of 2720 Poinsettia Drive, San Diego, Calif. Mr. Weathers has had some very unusual flights with this ship. The fuselage is three feet long and the wing chord at the center section six inches. The stabilizer is fifteen inches in span and the height of the rudder ten inches. The ship weighs exactly five and a half ounces. Weathers says:

"I have worked out a fool-proof rudder control with which the sailplane is equipped. I worked it out solely to keep it headed into the wind. For example, suppose the wind is taking it to the right. As this will naturally put the glider into a right bank, the weight to which the rudder is attached will also fall to the right; giving the ship left rudder, because the weight is on a wire which is parallel to the rudder. One must be careful to get just enough weight to swing the rudder and no more, however, so the center of gravity will not be changed to a great extent."

Weathers says that he would like to hear from other boys who have built models, especially gliders and speed jobs.

One of the most unusual airplanes that has been produced so far is the "Le Pou du Cial," or the "Flying Flea." This ship was designed and built in France recently. Not having been on the market for a long time only a few models have been built. We are, therefore, very pleased to receive a picture of a model of this ship, built by Kenneth W. Hamilton of 5411 Crenshaw Boulevard, Los Angeles, Calif. It is shown in picture No. 3. This is a flying scale model of



Pict. No. 9. Bert Martin's model in full flight. Note flag

the ship, built to a scale of one inch to the foot. The span is, therefore, twenty-two inches. Hamilton gives some information about the ship which may be of interest to our readers. He says:

"As you will note, the nose is different from that of the ship usually shown. That is, the nose found on the improved British version of the "Pou," which is being produced by the Abbott-Baynes Aircraft Company of Farnham, Surrey, England. The British version is being powered with the 28 b.h.p. Ford auto engine, with a special dual ignition aluminum head designed by the late Sir John Carden.

"The fuselage of the model is constructed in the same manner as that of the large ship and all surfaces have the correct number of ribs. The landing gear is shock absorbing. A free wheeling prop is employed and four strands of one-eighth flat rubber make up the power unit. The model has three coats of dope and is colored red and silver. Simple sheet aluminum fittings are used to rig the ship, making it easier to replace broken riggings.

"The model flies slowly and is surprisingly stable in gusty weather. Flights of about eighty feet on one hundred turns are the longest it has made, as I have not had the room to 'open it up' to its full flying capacity.

"This little ship proved quite a sensation when I took it out to the airport, in spite of the fact that there were many gas jobs present. When I flew it several times a crowd of several hundred model fans showed the greatest interest in this little ship."

A particularly fine-looking scale model is shown in picture No. 4. This was built by Paul Peterson. We are sorry we cannot give you Mr. Peterson's address, but he has neglected to include it in his letter. It is a Curtiss Goshawk F11C-2 and is an exact replica of the large ship. It has a complete control system. The motor is built up of balsa blocks and shows tappets, cooling fins, pushrods, carburetor, etc. It is equipped with radio, bomb release, aerial and camera gun. Other details are cockpit with pilot's seat and instrument panel, shock absorbing landing gear and cowl ventilators. The ship took about 250 hours to build from a kit. It weighs 3½ ounces complete. This is certainly a swell looking job, don't you think?

Here we have a very unusual picture. We are taking you back about twenty-five years just to show you that there were also "aeronuts" during the early days as well as now. Picture No. 5 shows a glider built by students of Tufts College in Medford, Mass., about 1910 or 1911. The glider really flew and in fact won the Intercollegiate Glider Contest held at Squantum, Mass., against Harvard, Cornell and M.I.T.

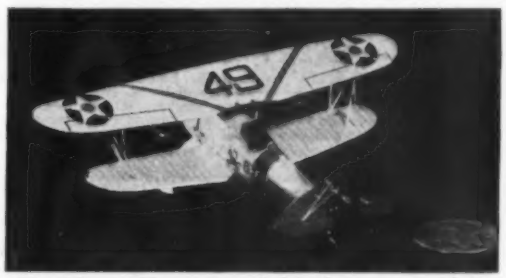
We are sure readers will undoubtedly be interested in the type of construction used in this glider. To present-day builders it strongly resembles a flying egg crate.

Picture No. 6 is not a "fake." It is only a miniature Curtiss Goshawk F11C-2. Its size can be estimated by comparing it with the five cent piece which appears in the picture beside the ship. The wing span is 3-15/16 inches. Peter B. Trump of 503 Baird Road, Merion, Pa., its builder, says he believes it to be one of the most complete models of its kind ever built. From inspection of its details in the picture, we are inclined to feel that Trump has not overstated this in the least.

You will note that the struts, wires, cockpit and other details are very carefully carried out and are extremely neat. It is constructed almost entirely of pine. Only parts such as the nose cowlings, removable plates, headrest and seat are made of thin sheet brass and aluminum. The fuselage is made in two halves and is hollow from nose to rudder-post. The wings are ribbed with thread and have paper leading edges. The motor is completely built up of about eighty pieces, using thread-wrapped cylinders. The anti-drag ring was formed by hand. *(Continued on page 30)*

Pict. No. 8. Contestants of the M.F.C. at the Australian Records Meet held recently at Box Hill near Sydney

Pict. No. 7. A model of a modern Japanese fighter, the Kawasaki C-5, by Hiroyasu Minowa



Pict. No. 6. You can stand this plane on a "nickel," Built by Peter Trump in great detail

Pict. No. 2. Elbert Weathers is an enthusiastic glider flier. Here is one of his 6 ft. ships

Pict. No. 10. Two winners at a glider contest held at Vincennes, France. The models differ considerably from American gliders

AERONCA C-3 SPORTPLANE

Is there anyone who doesn't know about the Aeronca C-3? That is, people who know anything at all about aircraft. We think the answer would be "hardly." The model is a very beautiful performer and is realistic in flight. It weighs only 1.9 oz. but has a span of 27" and length of 15¼". It is colored red wing and fuselage design, balance silver except black detail.

The complete kit to build this beautiful little plane contains 59 pieces of material, of which four are printed flat pieces of balsa wood, containing 78 individual parts which, added to the other parts in the kit, would contain 183 pieces. The above mentioned material in addition to the standard parts included in all C-D kits, there is included celluloid for the windshield, one Aeronca insignia sheet with figures 11 for fuselage sides, an instrument panel, a block for scale propellers, a pair of hardwood balloon wheels, two bronze bearings to be incorporated in the special nose blocks employed, two nose blocks drilled to accommodate propeller shaft and bronze bushings, a fine C-D type "Standard steel" slotted and drilled propeller hub, a card of striping tape, thread for brace wires and a balsa block for fuselage bottom in addition to the large, thoroughly detailed drawing with instructions. Kit SF-40 .... **$2.65**

EVERY ¾" C-D KIT CONTAINS

1. Full size assembly drawing. 2. Blocks and coloring for pilots. 3. Coloring for propellers, whether metal or wood. 4. Black for all details. 5. Thread for all bracewires (mostly new silver grey). 6. Printed out wood, not a few places rubber stamped, but every necessary curved piece printed out clearly on the finest grade of balsa wood obtainable. 7. All strip wood necessary. 8. Sufficient dope for the model, cement for glueing it together and tissue cement for applying the paper and coating. 9. Complete material for scale propeller as well as that for flying propeller. 10. Authentic rib and stringer material supplied now in all Kits (many filled-in fuselage jobs, too). 11. And, of course, all necessary insignia, color for striping with tape, special new shaped wood blocks, etc., where needed.

. . . And In Flying Mode[l]pla

There Can Be O[nly] C

Here, just as in other lines of business, there can be only [leader]—the only one best—the others must be second or third. Th[ere is] only o[ne]

Lighting the pathway of progress in the model aircraft field is almost unanimously attributed to CLEVELAND MODEL & SUPPLY CO., an organization entirely separated from any other business connection whatever, model or otherwise, for there is only one "Cleveland"—an organization entirely un-contaminated with ideas (stolen) from other sources, for here is an organization which, in the scale model aircraft field, first lit the candle of enlightenment in 1929 by completely disregarding all existing methods of model construction, and still holds the lighted candle burning brightly. Others who have imitated and tried to cash in on Cleveland leadership have turned their candles sideways, so to speak, and are burning both ends so that slowly both ends are coming to the center to "burn their hearts out."

This may be a somewhat unusual explanation describing the follies of the "Copycats". It is quite true, nevertheless, for one by one, since they first started to imitate those unimitable C-D's, the nearest approach has been a very inferior model. We claim that 90% of all Kits manufactured today employ ideas originated by ourselves, but we do take our hats off to those who have striven to produce something new and original, not simply a "modified" idea or a modification of a book or magazine article or idea. We ourselves have always tried hard to be fair. Many times it hurt badly and business was lost, but even then we did not quickly turn our heads and offer the model buying public something vastly inferior to our set standard or pull some little trick in order to get business at the unfair expense of someone else, saving on engineering costs and so on.

Undoubtedly, there may be some who will ask "how do they get that way"? If there be any such, simply let them refer to the older issues of publications supporting the model aircraft hobby to learn of the progress made by CLEVELAND, so that he may find out who produced Kits with *the* ideas first, that are now employed in 90% of the models produced today. Just let him look at the all-balsa construction—the extremely simple yet highly efficient fibre propeller, the fine movable control surfaces, many hundreds of authentic details, realistically duplicated—even to coloring, employed at one time only in CLEVELAND Kits, and

THEN, why buy "Copycat Kits"? Buy the original—Clev[eland-de]signed— the best there is to be had in the model world. Ben Frank[lin on]ce said, Let's hear of what "[...]ou've ..."

r of the / can trut / ght the / h those / ly not / ve been / s of the / than tho / "Cleve / t to run / periority. / ld like t / e you / s now, / Dwarf / prising / ything e / represen

[CO]PYCAT

Before 19[..] / all-balsa" / t that tim / may be / who still / way in / e original / uring, o / to the fu / have not / n whole / ry time / the t / then ou

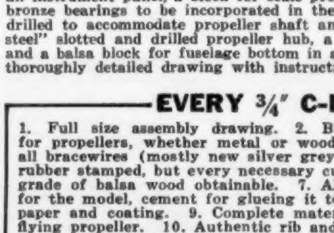
Read Before Ordering

Try your dealer first. If he [hasn't] what you want, order di[rect], enclosing check or money [order]. cash at your own risk. No C.O.D.'s. Please mention your dealer's [name and] address. Canada, Mexico, British Isles customers—add 10%; all other [countries] 20%. Send 3c for complete C-D catalog-folder.

D... / cov... / on ... / hav...

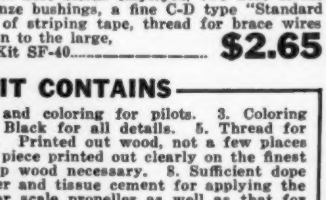
CLEVELAND MODEL [&] SU[PPLY]

1866-N3 W. 57th St. **"Even Better Tha[n Adv]ertise[d]"**



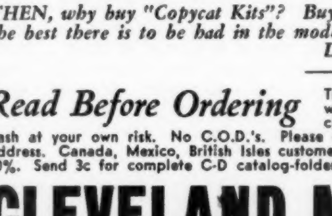
THE POWERFUL BOEING 247 TRANSPORT

Span 55½", length 38½". A wizard for flights with its twin motors pulling. The thoroughly engineered drawing of four large panels (17"x44") and supplementary sheet each contain accurate modeling information. Over 16 oz. of liquids, dope, cement, etc., one of the finest kits ever produced. Entirely gray in color. Kit SF-35 .... **$8.50**



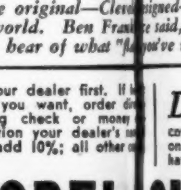
CURTISS F11C-2 (GOSHAWK)

High speed U. S. Navy shipboard fighter. We claim our Hawks (21, 49 and 50) the most accurate and finest to be found anywhere at any cost. Designed for advanced model builders who want a thoroughly detailed scale model and one which, when completed, represents the acme of perfection in model building. Span 23⅝". Silver, yellow, gray and green. Kit SF-49 .... **$3.75**



HOWARD RACER "IKE" (OR "MIKE")

These popular twins are known to all air race fans, having won many first place prizes. Our kit from which you may build either one, is easy to assemble into a beautiful decorative home ornament yet capable of interesting fast flights. Span 15⅝". All white. Kit SF-42..... **98c**



DOOLITTLE'[S GE]E-BEE

The daring stub[by] ... that place in Thomps[on Tro]phy Race Major "Jimmy" [Doolittl]e flew at an average of [...] M.P.H. wh[...] the Thompson "[...]" record. unusual flying m[...] Span 18... with red scallopin[g] ... SF-27 .... $

CURTISS ARMY HAWK P6E

Colored like Hawks in 17th Pursuit group, yellow, olive drab, black and white. Our redesigned model is the most advanced type to be found anywhere. Many details. Often built by the best model builders when "first prize" is sought like our SF-49. Fast flights. Span 23⅝". Kit SF-21 .... **$3.25**

MONOCOUPE SPORTPLANE

Two place monoplane also used for pylon, cross country racing and stunting. Very popular and to be found at nearly every airport. Easy to build, a good flier and very attractive. A "first prize" winner everywhere. Span 24". Cream and orange. Kit SF-28.................. **$2.50**

BAYLES' GEE-BEE RACER

This stubby little plane won the '31 Thompson trophy race. Had a very short fuselage which made it very maneuverable flying the pylons. Our model is redesigned and the most accurate model of its type on the market. Wing span 17⅛". Yellow and black. SF-17 .... **$1.95**

VON RICHTH[OF]EN'S F[OKKER] TRI[PLA]NE

Flown by the fa[mous Re]d Kni[ght ...] the close of the [...]. Colore[d] red with silver [an]d white [...] it was easily d[...]ished f[rom] "tripes"—and av[...] oppon[ents] maneuvering and [...] were c[...] tic of both the [...] e and $ model. Span 17⅝" SF-14...

...plane Designing . . .
...y One Leader!

...e—the others must be followers. There can be ...nly one "first idea"—the others must be copied.

...e of the 1001 ideas, both big and little, produced by us, ... truthfully say, and have full faith in our belief, that ...ght the candle to show the way. We would like to hear ... those who agree and those who disagree—if there be ... not tell us what you have noticed in other designs ...e been so flagrantly imitative of C-D's and their details, ... of the ideas you believe others have originated that are ... than those which carry the world famous trade mark of ... "Cleveland." Each month hereafter (space permitting) ...t to run a box entitled "COPYCATS Acknowledge Cleve...eriority." While writing about this why not tell us what ... like to see us design in the way of new models and in ...e you would like to see these designs appear. We have ... now, you know, the larger, ¾" scale SF, the smaller ... Dwarf or D and the new representative scale or REP ...rising representative flying models, more for duration ...thing else, yet bear...g a respectable likeness to the real ... represents. The latter, described fully on back cover of ...g.

...PYCATS" Acknowledge C-D Superiority

Did You Notice These?

...time 1929 no "respectable" manufacturer would think of produc...ll-balsa" model. Cleveland, however, had no "respect" for existing ...at that time and brought out the first of present-day all-balsa models. ...re may be a few who still use, for instance, bamboo and reed, and per...e who still "nail" models together, who hasn't followed where Cleveland ...e way in all-balsa scale models?

...e original C-D phrase used on Cleveland drawings, "Infringements by ...ring, or duplicating all or part of these drawings will be severely ...to the full extent of the law," is believed a standard legal phrase by ...ers not thoroughly investigated or who know only how to copy the ...n whole or part.

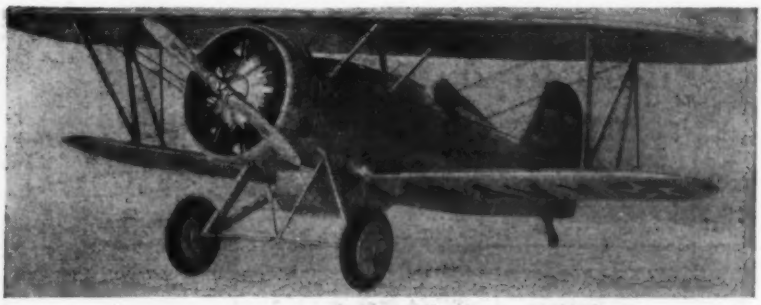
...ery time a Vought Corsair model is produced, have you noticed how ...en the top wing C-D color striping for Vought Corsairs which we ...d when our model was produced late in 1933? (TO BE CONTINUED.)

...ginal—and get the leading, real thing every time—...e said, "Imitation is the sincerest form of flattery." ...ve noticed.

Dealers! 1935 demands so great for C-D's that hundreds of orders were turned down. Now with our new 20" line (see back cover) you can make 1936 a record year. Write at once on letterhead for dealer details. Clubs too! We also have a very fine line of supplies.

...SUPPLY CO., INC.

...ertised" Cleveland, Ohio, U. S. A.



NAVY BOEING F4B-3 and -4 FIGHTER

The information in this kit enables the building of the F4B4 with two very minor changes, as explained. The model has a very realistic looking removable belly tank, the motor end ring may also be removed. This same design of which the Army version is the P12-E, may also be made from this standard kit with the exception of the colored dopes which are supplied, the Army requiring yellow and olive drab while the dopes supplied in this kit are silver, yellow and red in addition to the black for details. The model even with all its details, weighs only 3.2 ozs. and, due to its large wing area, is capable of excellent flights. Span 22½", length 15¾" colored all silver except the yellow top of upper wing and red tail surfaces; also a double red stripe on top of upper wing and the standard U. S. star and circle insignia.

The complete kit to build this model contains 66 parts which, among the standard parts contained in all C-D kits, there will be found celluloid for windshields, material for making the scale propeller, one sheet of black lettering tissue, one large pair of star and circle insignia, one small pair of star and circle insignia, one instrument panel, one C-D slotted and drilled "Standard steel" type propeller hub, thread for brace wires, hardwood wheels and the authentically engineered C-D drawing containing two large, close-up photographs. Kit SF-29..... **2.85**

The Complete Line of C-D ½" (DWARF) Models

★ ★ ★ *The Big Sensation of the Model Airplane World* ★ ★ ★

These are precisely like the ¾" models illustrated here—with a few minor exceptions. For coloring—we recommend the same colors as used on ¾" design of the same model. Remember DWARF Kits DO NOT CONTAIN ANY LIQUIDS, or STRIPING TAPE.

No.	Name	Span	Price
D- 1	Gr. L. Sport. Trainer	13 3/8	$ .65
D- 2	Tr. Air. Mystery Ship	14 1/3	.50
D- 6	Army Boeing P12-E	15	.65
D-11	A-W Quad Fighter	14	.45
D-14	Fokker Triplane	11 3/4	.45
D-15	Fokker D-7 Fighter	14 1/8	.60
D-17	Bayle's '31 Gee-Bee	11 3/8	.50
D-18	Howard "Pete" Racer	10	.30
D-19	Supermarine S.6B	15	.65
D-20	Hawker Fury Fighter	15	.45
D-21	Hawk P6-E Fighter	15 3/4	.75
D-23	Boeing P-26 Fighter	14 1/8	.65
D-24	Lockheed Vega	20 1/3	.55
D-26	Heath Parasol Sport	15 1/3	.35
D-27	Doolittle's Gee-Bee	12 1/8	.50
D-28	Monocoupe Sportplane	16	.45
D-29	Boeing F4B-3 Fight	15	.65
D-32	Boeing 95 Mailplane	22 1/4	.85
D-33	Comper Swift Lightpl.	13	.30
D-35	Boeing 247 Transport	36 7/8	2.50
D-36	Lincoln Sportplane	10	.25
D-37	Waco C Cabinplane	10 1/2	.75
D-40	Aeronca C-3 Sport	13	.40
D-41	Vought Corsair Fight.	13	.85
D-42	Howard "Ike" Racer	10 1/8	.25
D-43	Douglas O-38 Obs.	20	.85
D-45	Martin Bomber	35 5/8	2.50
D-46	Laird Solution Racer	10 5/8	.50
D-47	35 Wedell's W. Wms.	13	.50
D-48	34 Turner's W. Wms.	13	.50
D-49	Curtiss F11C-3	13 3/4	.85

Buy as few, or as many as you want—10c packing charge has been discontinued

...E-BEE RACER

...rn that took first ...by Race of 1932. ...e flew the course ...P.H. which is still ...ecord. Make this ...an 18¾". White ... **2.50**

...N'S FOKKER ...NE

...ed Knight before ... Colored brilliant ...d white markings, ...ished from other ...r opponents. Quick ... ware characteris...e and ... **2.50**
SF-14

U. S. ARMY BOEING P26

A standard fighter of the army squadrons, this ship is one of the world's fastest pursuit planes. Developed along the lines of modern racers, it is capable of pursuit or light bombing work. Thrilling fast flights. Span 20⅝". Colored yellow and olive drab. Kit **$2.50**
SF-23

GREAT LAKES SPORT TRAINER

This beauty is probably the best liked and most maneuverable 90 H.P. plane in its class. An attraction wherever displayed with its interesting swept-back wings similar to modern dive bombers. Model has good flying qualities, span 20", colored orange and cream. Kit **$2.65**
SF-1

SUPERMARINE S6.B RACER

Flight Lt. Stainforth won the permanent possession of the Schneider Trophy for Great Britain in 1931 with this graceful seaplane. Model well suited for exhibition when carefully built. Will take off water and fly beautifully at a high speed. Span 22½". Silver and blue. Kit **$2.50**
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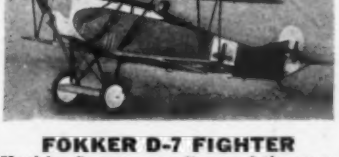


FOKKER D-7 FIGHTER

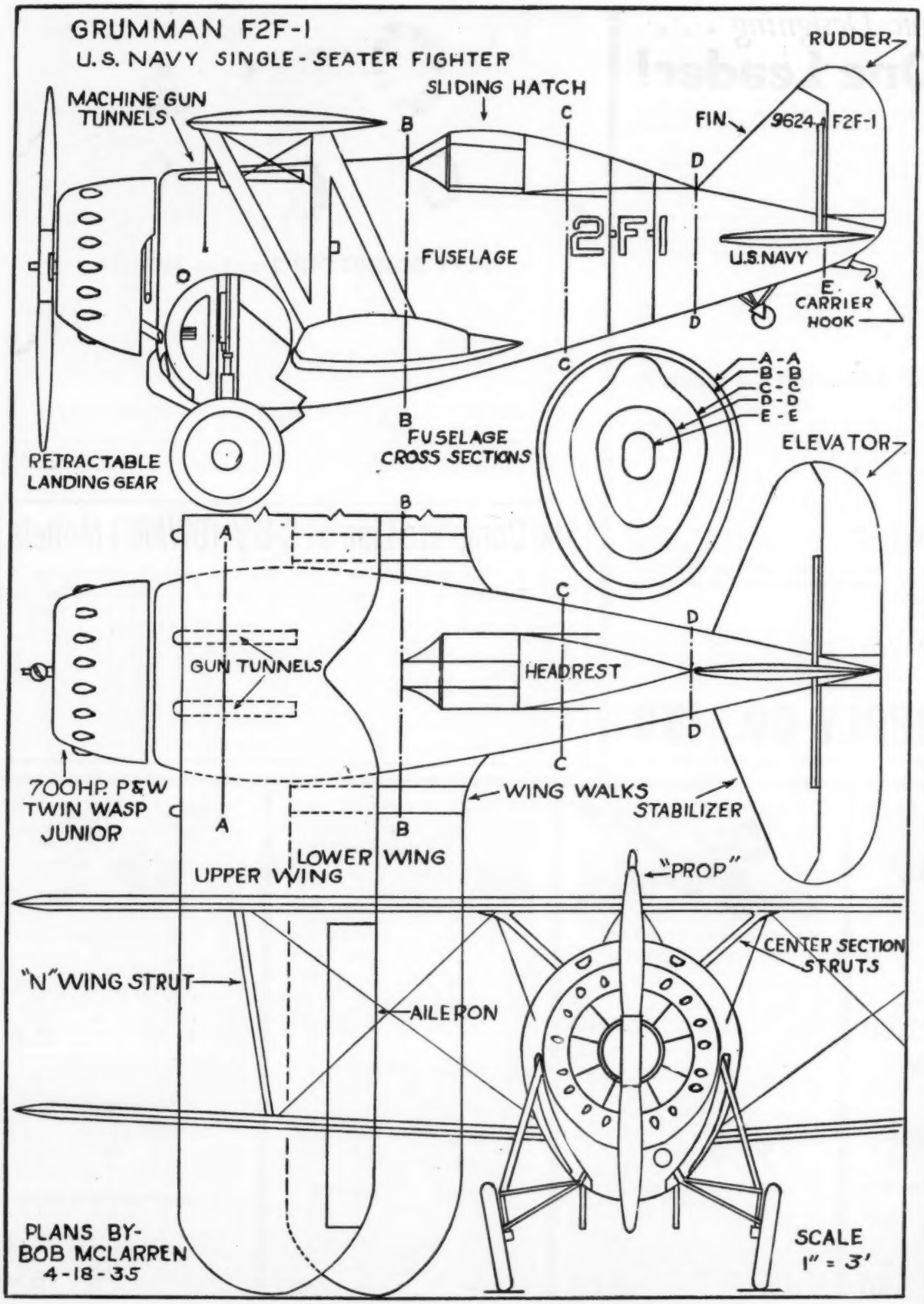
Used by German aces, it earned the reputation of most efficient fighter of the world war in actual service, being fast, maneuverable and could make long dives without shedding its wings. Redesigned model is 100% authentic, and beautifully colored, orange, green and white. Great flights. Kit **$2.95**
SF-15

U. S. ARMY BOEING P12-E

Many employed in U.S. Army pursuit squadrons. Maneuverability, speed, fast climb and ability to dive vertically make them fierce defensive weapons. Model gayly colored like real P12-E with red trimmings, yellow wings, tail and stripes. Olive drab fuselage also color striped. Span 22½". Kit **$2.85**
SF-8

U. S. ARMY MARTIN BOMBER

Span 53⅛", length 33⅛". Nothing ever before like it. Novel and strong method of duplicating an almost impossible landing gear (but not retractable—however it may be done). Turned balsa invisible hub wheels. Colored standard U.S. Army yellow, olive drab details black. **$8.50**
A real kit. Kit SF-45


GRUMMAN F2F-1
U.S. NAVY SINGLE-SEATER FIGHTER
RUDDER
SLIDING HATCH
MACHINE GUN TUNNELS
FIN
9624
F2F-1
FUSELAGE
2F1
U.S.NAVY
CARRIER HOOK
A-A
B-B
C-C
D-D
E-E
FUSELAGE CROSS SECTIONS
RETRACTABLE LANDING GEAR
ELEVATOR
GUN TUNNELS
HEADREST
700HP. P&W TWIN WASP JUNIOR
WING WALKS
STABILIZER
LOWER WING
UPPER WING
"PROP"
CENTER SECTION STRUTS
"N" WING STRUT
AILERON
PLANS BY-
BOB MCLARREN
4-18-35
SCALE
1" = 3'

How to Build A Grumman Fighter Model

A Complete Description of How You Can Create an Attractive Model of One of Uncle Sam's Greatest Airplanes

The U.S. Navy Fighter, Grumman F2F-1

By ROBERT McLARREN

THERE has recently made its appearance on the Pacific Coast, a stubby little Navy fighter of tremendous speed. With landing gear fully retracted, these speedy single-seaters suddenly come roaring out of the sky, scream over your head, and with a tremendous burst of speed once more disappear into the clouds. Eighteen of them have recently been delivered to the 2nd Fighting Squadron, stationed at North Island Naval Air Station, San Diego, Calif. These swift speedsters are designed and manufactured by the famous Grumman Aircraft Company of Farmingdale, Long Island, New York. The speedy Grumman FF-1 and SF-1 two-seaters had hardly tested their wings when this little racer made its initial appearance. Known officially as the F2F-1s and powered with a Pratt & Whitney Twin Wasp Junior engine, model YR-1535-72 of 700 horsepower, these planes are expected to reach speeds of nearly 280 miles per hour which will make them the fastest military plane in the world.

Unfortunately, it is quite evident that this stubby little racer is not well adapted to flying model proportions. However, it will make one of the most interesting and speedy looking solid scale models yet drawn up. The landing gear is the most interesting part of this model and here is the point where the model builders' adaptness for detail will come to light. No doubt there are many of you who, with a little painstaking care and a lot of thought could make the landing gear actually retractable, but for the majority of us, I believe the landing gear should best be built in the extended position. As it is to be a shelf model, it would naturally have to sit with the wheels down. So, bearing this in mind, let us begin with the construction.

Fuselage

The fuselage should be taken first so that it can form a basis for our model and to which we can attach the wing and tail surfaces. Here again the model builders' ability should play a large part in that this model can either be built from a solid block of pine or balsa or can be "built up." I have included in the plans a complete set of fuselage cross-sections from which the formers can be built up. It can then be covered either with silk, paper or with inlaid wood. The fuselage is nearly oval in shape. Each oval becoming less as we approach the rudder until it becomes a perfect circle at or near the rudder posts. It should be noted that the tail surfaces are quite a distance above the center line.

Take a block of wood and whittle upward from the bottom, beginning about the center of the block. Whittle off the edges of the block until you have it in an oval shape. This gives you the fuselage in a rough shape. The engine cowling should be whittled from a solid block and glued on after the fuselage is complete. Therefore, leave the nose of your block perfectly flat. Sand the fuselage down well until you have a smooth, oval shape, tapering fuselage. The pilot's headrest should be cut in a separate piece and glued on. Therefore, leave the rear upper section flat and the bottom of the headrest flat, then glue together. This makes it much easier to fit the headrest to the fuselage than trying to chisel out a curve in your headrest to fit the curvature of the body.

Cut out the cockpit section and glue a bamboo framework over the pilot's cockpit. Then glue cellophane to the framework. This will make you a neat cockpit enclosure. Two grooves should be cut along the upper front of the body to imitate machine-gun tunnels. The landing gear cut-outs should not prove difficult to make. Whittle the section out so that the complete cut-out forms a right angle looking from the front. In other words, cut straight up from the bottom and straight in from the sides.

Wing and Tail Surfaces

The wings are very simple to make. The upper wing has no dihedral and can be cut from a single sheet of balsa or pine, whichever you are making your model from. Sandpaper it down until it has the proper curvature and whittle off the wing tips. Sand them down well and cut out the center section over the pilot's head for his visibility. The lower wing is made in two parts and glued on the fuselage at a dihedral angle. The tips should be about ¼ inch above the point where the wing contacts the fuselage. The lower wings should be glued on first. Use plenty of glue or ambroid so that you have a good, solid joint. While this is drying, cut out and glue on the four center section posts to support the upper wing.

When the lower wings and center posts are well dried you are ready to put on the upper wing. The two "N" struts may either be glued on the upper wing first, on the lower wing first or glued in after the upper wing is glued onto the center posts. I would prefer gluing them on the lower wing at the correct angle and then lay the upper wing on the whole set of bracings. It is well to remember that you are going to put in the flying and landing wire threads at this point. They should be glued at the bottom points first then laid across the top point before laying the upper wing on them.

The wires are "crissed-crossed" running as follows: from the point where the lower wing joins the fuselage at the front to the rear upper station of the "N" struts. A second group is run from the point where the rear center section post joins the upper wing to a point half-way down the fuselage. The threads could be wrapped around short pins and thrust into the fuselage or glued directly on to the side of the fuselage.

Close scrutiny should be given to the enclosed photographs at this point, as the drawings do not show the flying wires clearly. The "N" strut blocks out the wires in a straight side view. The ailerons can either be made movable with small aluminum hinges made from strips or can be imitated with grooves cut by a knife. The tail surfaces are quite conventional, cut from ⅛ balsa sheets. The tail controls can also be made movable with these small aluminum hinges driven into the rudder and the fin or sewn together with thread. The rudder and elevators do not connect to the fin and stabilizer in a straight line but are cut off at an angle, thus giving balanced rudders and elevators. A strut is run from a point ⅔ way up on the rudder to a point ⅔ way out on the elevators.

Cowling and Landing Gear

The cowling is not a complete cylindrical enclosure but is somewhat in the form of an oblique cylinder. The lower portion drops away slightly giving a speedy effect. The cowling should be cut from a solid block of wood. First, cut into a perfectly rounded cylinder. Then begin at the top of the block, laying flat down on the table, and whittle downward and outward. The small blisters on the cowling are very difficult to make. They may either be carved from small blocks of wood and glued on or carved from the cowling block or left off entirely.

The engine detail is all according to the

(Continued on page 45)

Aviation Advisory Board

Conducted by
CHARLES HAMPSON GRANT
Chairman of the Board
Formerly of
The Technical Section, Air Service, U.S. Army

A VERY interesting question has arisen concerning the application of formulae to the design of model aircraft. Mr. Robert K. Allen of 718 Wood Street, Wilkinsburg, Pa., is in charge of a large model organization in that vicinity. He has recently written to the editor stating that he is the "arch enemy" of Mr. Grant's formulae as applied to model airplanes, inferring the following question:

Question: Why are formulae applied to the design of model airplanes?

Answer: There are several good reasons for this application, which may be enumerated as follows:

First, it is necessary to apply formulae to the design of large airplanes in order to produce machines which operate efficiently, and indeed operate at all. Inasmuch as model airplane building is merely a means of preparing young aviation students for a future career in aviation, or for at least giving them some idea as to the laws which govern the flight of airplanes, it is therefore advisable and instructive to apply formulae to the design of model airplanes. It thus gives the student of model building an idea as to the relative values of the forces acting on airplanes in flight. It helps to give them a picture of how these forces act.

In this way a clear understanding of the whole problem is obtained, which clear conception cannot be obtained in any other way.

It is true that all model airplane builders cannot understand formulae. In fact, these formulae were not presented for those who could not understand them, but for those only who wished to go into the subject deeply and gain an understanding of the reasons back of any particular design of model. Those who have read Mr. Grant's articles carefully, know that for every formula given there has first been given a very simple rule which the beginner or novice could understand and which rule was the essence or basis for the formula. In other words, the beginner should follow the simple rule while the advanced student may go further into the subject by analyzing and using the formula.

For example, a formula was given for the correct area of the stabilizer. This formula appears to be rather involved; it shows what forces govern the area of the stabilizer and what their relative values are. However, a simple rule stated in a few words, which anyone could understand, was given for the area of the stabilizer. This rule does not provide the accuracy that is insured by the formula. However, it is sufficiently accurate for practical results and should be used by the beginners and novices, or wherever instructions are given to classes. If the rule is followed, the model designer will find that his model will be very stable.

A simple rule is that the area of the stabilizer should be about one-third the area of the main supporting surface. The required area varies with different types of machines, but if this rule is used in all cases, good results should be obtained. Variations of this rule are simply stated in the articles by Mr. Grant. Before this simple rule was advocated by Mr. Grant in 1927, stabilizer areas were considerably less than one-third the wing area and very unstable models resulted. This rule was passed on to Mr. Carl Goldberg by Mr. Grant in 1928. He found it very advantageous and incorporated it in many of his models. Since that time the use of this rule has become universal, which obviously proves that any model builder could understand it. The *reasons which underlie* the rule are explained by the formula for stabilizer area.

Under these conditions we cannot understand why Mr. Allen is an enemy of formulae as applied to model airplanes It has been the experience of many people that the use of formulae in model airplane designing has increased the proficiency of model designers in the study of algebra and has contributed largely to higher marks in this and many other subjects. This has been verified by teachers of these subjects. Formulae in connection with model airplane building has created the desire to understand algebra on the part of model builders. The value of this alone to all the boys throughout the country is well worth while the sting of any criticism which may rise out of it.

We have information from Captain Roland Birnn of Fort Leavenworth, Kansas, which may answer the questions of many model builders. It is as follows:

Answer: The fuselage of Army Air Corps airplanes, formerly painted an olive drab color will hereafter be painted a blue. This will be the Peace-time color. There has been no change in wing or tail group color.

Jack Abbott of 3299 West 30th Street, Cleveland, Ohio, writes in to us and asks several questions, some of which indicate the value of the simple rules on design given in the articles, "The Aerodynamic Design of the Model Plane."

Question: What should the ratio of areas of elevator and rudder surfaces be compared to wing surfaces on a commercial endurance plane?

Answer: The stabilizer area should be at least thirty-three per cent of the wing area, thirty-five per cent would give even greater stability. The rudder or fin area should be approximately twelve per cent of the wing area.

Question: What would cause a commer-

(Continued on page 48)

Italian warplanes immediately after landing in Somaliland. Mechanics are refueling them. Note that these ships are of old design similar to Fokker tri-motors. Engines are not cowled.

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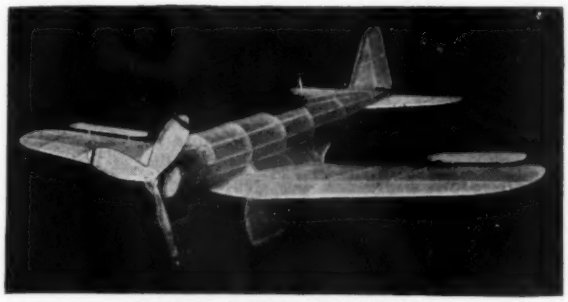

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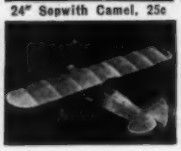

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- ☐ Polish Fighter
- ☐ Monocoupe
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- ☐ S. E. 5
- ☐ Spad
- ☐ Jap Kawasaki
- ☐ Russian Fighter
- ☐ Sopwith Camel
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(Continued from page 23)

MODEL NEWS FROM OTHER COUNTRIES

Japan

From far-off Japan, Hiroyasu Minowa of the Nishiki Club sends us picture No. 7. It shows the Kawasaki C-5 flying scale model. This is only one of the many models which he has constructed. This ship has a span of ninety centimeters or about thirty-one inches. As can be seen, the workmanship is exceedingly fine, as is usually the case with models made by young Japanese boys. They take great pride in their accuracy.

Australia

Mr. Ivor Freshman of the Model Flying Club of Australia sends us pictures No. 8 and No. 9. Picture No. 8 shows some of the contestants who were assembled for the Australian record flights at Box Hill.

Picture No. 9 shows Bert Martin's model in full flight. In picture No. 8, Martin can be seen with his model at the left hand side of the picture.

A little while ago A. Huxley established a new record in the Angus & Coote contest. He flew his ship for thirty-seven minutes, forty-five seconds. After that the model went out of sight. The machine was a cabin job, which remained over the field most of the time at a very considerable height.

France

Picture No. 10 shows the winners of a glider contest held at Vincennes, France. It is interesting to see the types of gliders built by our French friends.

The Ligue Aeronautique De France of 18 Avenue Victor-Emmanuel III, Paris, has a very interesting club magazine, called "Revue Des Modeles Reduits." Those readers who are familiar with French may find this club periodical very interesting and we suggest that they write to the club and inquire whether or not they can have this magazine sent to them.

New Zealand

Mr. F. J. Brown, secretary of the New Plymouth Model Aero Club of New Zealand, sends us a few interesting notes of his club activities. He says:

"Arrangements are well in hand for the conference and flying week to be held in January."

Readers will note that in the Eastern hemisphere, January is a summer month. Mr. Brown continues:

"Representatives from clubs all over the North Island will compete. This will be the biggest event of its kind in the history of model aviation in New Zealand. The fact that New Plymouth has been selected as the venue, shows that the club has a real live executive.

"Mr. Thorne is teaching navigation to the club by holding regular classes."

Here we have some gas model news from Mr. Brown which evidently slipped through the "Gas Lines" column. It is:

"N. Lambert, the builder of F. J. Brown's gas job, reports good progress. This monster model with an eight foot wingspread, six foot fuselage and powered with a Brown Junior petrol engine, will be the first of its kind in Taranaki. It should prove an outstanding attraction at the big flying week in January."

CLUB NEWS

Philadelphia, Pa.

The Philadelphia Model Airplane Association is in the middle of its seventh season. So far seven endurance meets have been held, at intervals of two weeks. The first two meets were outdoors. No exceptional times are usually made at the P.M.A.A. outdoor meets, since sufficient timers are not available to allow ships to be followed.

The indoor meets are alternately junior and senior meets. These meets are held in the 108th Regiment Armory, a hall with a rather low ceiling and many girders and hanging lights to ensnare the ships, so that while good flights are sometimes made, a lot of luck is needed to avoid the many obstacles. Another difficulty is that only two and a half hours are allowed for the duration of a meet, and sometimes it is found necessary to shorten this time.

In spite of these drawbacks a great deal of enthusiasm exists among the boys and the competition is very keen. At every meet ribbons are awarded to the first four place winners in each event. A point system is also in operation by which points are awarded to place winners and also to those who make satisfactory flights without placing. At the end of the season, special awards are made to the boys who have earned the greatest number of points during the season. In addition to the individual competition, there is also a chapter competition to choose the championship chapter.

The individual performance of Robert Jacobson, of the Northeast chapter, is particularly noteworthy. Jacobson has earned five first places in the five meets for which he was eligible and leads all contestants in number of points earned. Another remarkable performance is that of William Wert of the Caterpillar chapter, who set two new R.O.W. records during the second junior meet. His records are nine minutes, twenty-seven seconds for Class B. R.O.W., and seven minutes, nineteen seconds for Class A. R.O.W. These flights exceed the National Aeronautic Association records for juniors.

Chicago, Illinois

Robert C. Kaergard, secretary of the Illinois Model Aero Club of 430 South Michigan Avenue, Chicago, Illinois, writes us the following:

"At the bi-annual election we have elected the following officers: President, Walter Getsla; Vice Pres., Walter March; Treasurer, William Gough, Jr.; Secretary, Robert Kaergard; The Contest Committee: Walter Getsla, Joseph Litwin, William Gough, Jr., Harry Dolfi.

"In the last four local contests we have won four first places and in the National Meets (Junior Birdmen) we have won two firsts and one second.

"We take pride in claiming to be the oldest model club in existence, originating in 1911 and continuing to date.

"Walter L. Brock of London-Paris-London race in 1914 fame has been our director for the past twenty years."

News from Various Cities

Mr. Irwin Polk, well known among model builders of the East, has collected some interesting and helpful information for Air Ways readers. He gives it as follows:

A scale model contest, open to any boy or girl under 18 years of age was conducted by the Davison-Paxon department store in Atlanta, Georgia. Major Al Williams headed the committee of judges and staged a one man air show at Candler Field after the exhibition.

Chicago Wing of the Junior Birdmen is offering a round trip by air from Chicago to New York to the boy and girl bringing in most new members.

George Brennan, 18, the 50,000th member of the Chicago Wing was honored by having Rear Admiral Richard E. Byrd present him with his club pin.

Stanley Reid, of Hamilton, Ontario, reports a scale model exhibit which was conducted by his club, the Wasp Flight Squadron. Ted Ryan, Tom Kiele and Lawrie Stuart were awarded first, second and third prizes consecutively for outstanding models.

Harry M. Krytzer, of the High School of Commerce and Howard E. Thompson of the Ungraded School of San Francisco have started model clubs in their schools.

Charles H. Brinkmeyer, veteran model builder, is conducting model building classes every Thursday, in the basement of School 80 on Twenty Second Street and Homewood Ave., in Baltimore, Maryland.

Leighton Webb, won first place and established what is believed to be a new record for outdoor R.O.W. models with a flight of 2 minutes 8⅘ seconds, at the James Field Outdoor Model Plane Contest held recently in Rochester under Junior Birdmen auspices.

The Boston Wing of the Junior Birdmen, in addition to monthly contests, conducted a "Swap Day" at the local headquarters and workshop. Members gathered to swap whatever model material and supplies they had. No doubt, the exchanging of ideas was the most important trading done that day.

Mr. H. Stokes Walesby, Detroit Junior Birdmen Wing Commander, has been named state advisor of Junior Aeronautical activities of the state of Michigan by W.P.A. supervisor of that state. This is most helpful to model aviation. It is hoped that other states and cities will follow suit.

John Hulstrunck, in charge of model airplane activities for the Board of Education in the city of Newark, N.J., maintains a very active program with his group by conducting a contest every Wednesday evening from 7 P.M. to 9 P.M. in the auditorium of the Cleveland Junior High School on Bergen Street in Newark. Seventy-five to a hundred boys attend these evening weekly contests and

(Continued on page 47)

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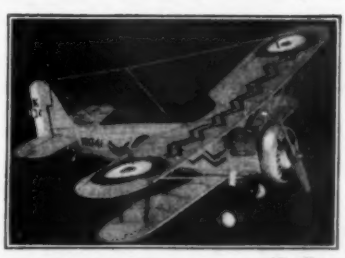

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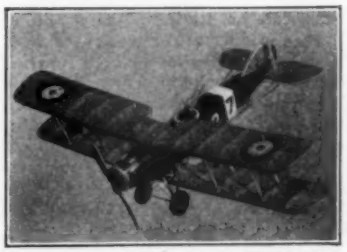

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"Fool-Proof" Airplanes

(Continued from page 5)

makes the chances of overshooting or undershooting a field practically nil.

Let's see how this will work out in actual flight.

"If the pilot finds that he has started his glide too early," Geisse explains, "he will simply move the lever forward slightly, thus opening the throttle. If he finds he is going to overshoot the field, he will simply pull the lever back and thus shorten the glide by applying the air-braking effects of the flaps. The difficulty of landing on a predetermined spot with the conventional airplane control is attested to by the spot landing contests which are a feature of every air meet. It is hoped that with the new method of control, the novice will be able to equal the performance previously attained in these contests by the experts."

Another new craft that is being tested not only has no rudder, but has no tail at all—just a little stub cabin slung under the monoplane wing. It is the Waterman tailless Arrowplane, Type W-4A. The ship is built in the shape of an arrow-head, the wings being swept back at a sharp angle. The engine is mounted at the rear of the cabin, which resembles a low-slung automobile. It is completely enclosed and pilot and passenger sit side by side. The fuselage is of all-metal construction while the wings are built of wood, metal and fabric. Power is furnished by a 95 horsepower inverted 4 cylinder air-cooled Menasco.

The landing gear consists of three wheels, one at the forward end of the cabin and the other two well behind the center of gravity. It is claimed that by this arrangement, a good unbounced landing can be made no matter what attitude the plane is in when it hits the ground—nose down or nose all the way up. About the only way a pilot can crash it is to fly into the side of a house.

Take-offs are accomplished in a manner very different from the normal airplane. The usual procedure entails pushing the stick all the way forward during the initial run to get the tail off the ground. The reverse is true of the W-4A. The stick is held well back during the initial run and if held in this position, the airplane will take itself off and assume a normal climb when sufficient speed has been obtained. It is impossible to force it off before it has obtained the correct amount of flying speed, an opposite feature from that found in normal airplanes which has resulted in many serious mishaps to student pilots.

Turns can be made by using either ailerons or rudder alone, without the use of the other. The ailerons also function as elevators and when the stick is pulled back or pushed forward, the ailerons move together to nose the plane up or down. Another radical feature of the plane are the rudders. At each wing-tip is a fin with a rudder attached to it. These rudders are simply "drag elements." If a turn to the left is desired, the left rudder pedal is kicked, swinging the left rudder out into the airstream. The drag produced on this side swings the plane around in that direction. Both rudders may be deflected simultaneously to act as air brakes, slowing the plane down and reducing the gliding angle.

One of its outstanding characteristics is that it is impossible to spin. Pilots have taken it up and have tried by every possible means to force the little ship into a tailspin, but without success. No matter what you do to it, it just won't go out of control. And that's a tremendous step forward for the private owner.

It has a top speed of 110 miles per hour and cruises at 95. It has a range of 350 miles and gets 13½ miles to a gallon of gasoline.

The ship that the Bureau has given its greatest stamp of approval to so far is the Hammond Model Y, which won the competition last year for an airplane in which comfort and safety were put first. The first of these planes is just out of the factory workshops and the Bureau has ordered 15 of them for use by its aeronautical inspectors on their regular trips throughout the United States in connection with licensing and regulation activities.

When this ship was first put through its paces out at Wayne County Airport, near Detroit, there was a group of old airline pilots on the field. They saw the pilot come down in a steep dive straight towards the center of the field. He made no effort to level off, handling the controls worse than the most hopeles student. Some of the pilots who were watching, literally put their arms in front of their eyes as the plane was actually dived into the ground.

What happened? The plane, which is provided with three wheels, struck on the first wheel but instead of nosing over, dropped its two rear wheels down with a loud "plunk" and stuck there. It didn't roll more than a couple of feet, yet nothing was broken or even strained. In fact it was a fairly good landing.

Again and again the test pilot made what appeared to be crash landings but the sturdy little ship proved that it could take it. It is the most remarkable ship that this writer has ever seen. You really don't have to take it off or land it. It very accommodatingly takes charge of those important maneuvers itself.

The ship, as the accompanying photographs show, is mounted on the landing gear so that it is in flying position as it rests on the ground. The pilot doesn't have to worry about getting the tail up, as in other planes. He simply pours the soup to the engine and the ship lifts herself off. In landing, the stick is held back and the plane floats in almost like an autogiro. It doesn't roll even its own

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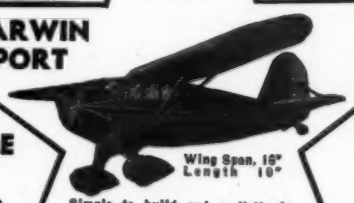

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Every model is packed in a beautiful, sturdy box with semi-finished flying or scale propeller, formed wire hooks, scaled wheels, with brass bushings, ribs printed out accurately on white sheet balsa, many special turned wood parts, finest grade of balsa wood sticks, tail wheel and fork fittings, and wire, pure para rubber, colored paper, authentic markings, colored insignia, best quality cement, colored dopes, full-size easy-to-understand plan.

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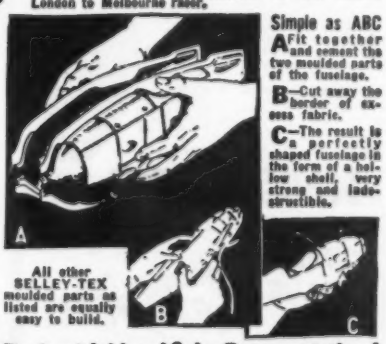

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length after striking the ground.

It is so easy to operate that it has been proved that it can be flown alone by the average person after two or thre hours of instruction. The fact that it can be landed in a steep glide without gaining excessive speed makes it possible to clear high obstacles and get into a very small plot of ground.

It is a low-wing pusher monoplane, seating two persons side by side. Its cruising speed is in excess of 110 miles per hour.

The Bureau held another competition, this one for light planes of all metal construction, and a contract has been awarded the Curtiss-Wright Airplane Company for an experimental plane to be delivered late this year.

It is a low-wing, all-metal, two-place cabin monoplane. In general appearance, the plane bears a resemblance to the new speedy multi-motored craft now in use on many air lines. There is a further similarity in the all-metal construction. However, in other respects the design of the two-place plane follows far different lines for its biggest consideration is ease of operation.

Mr. Geisse states that this plane represents an investigation of the possibilities of metal construction, including stressed skin construction (in which the metal covering of wings and other parts carries some of the flight load), in designing for private owners. Specifications for this plane call for a minimum level flight speed of not more than 48 miles per hour and a maximum speed of 125 miles per hour.

The Bureau is also investigating one of the new wingless autogiros. It is planned to improve this ship with the "jump-off feature," an entirely new principle which has been developed secretly and up to this writing has not yet been publicly shown. It operates like this: At the takeoff, the blades are set at a flat angle of incidence and the rotor is run to about 130 r.p.m.s. The blades are then suddenly set at a high angle of incidence, about 5 degrees, producing a tremendous lifting force. Without rolling forward an inch, the 'giro leaps straight up into the air like a grass-hopper. It is thus able to duplicate the performance of the helicopter and can takeoff from a space no larger than the ship itself.

One of the greatest features is the possibility of folding the rotor back and throwing a clutch, which disconnects the propeller from the engine, driving the wheels instead—thus making the autogiro practically an automobile for ground operation. It is possible to house the 'giro at home and drive it over highways to the nearest suitable field for take-off.

All of these ships that have been discussed, stress the comfort, safety and usefulness of aircraft. But what about the other factor, cost? If aviation is to become the sport of any but the wealthy, the price of aircraft must come down. The most expensive feature has always been the engine. Aircraft engines at present run a little more than $10 per horsepower. An aircraft engine of 90 horsepower costs $1,000, while an automobile engine of equal power can be pur-

chased for less than $150.

What's the answer? Adapt the automobile engine for use in airplanes, say Bureau officials. And they have put their heads together and have proved that it can be done, with highly successful results. The performance of the plane will be just about the same, they have found, except that its useful load must be less to compensate for the additional weight of the automobile engine.

The first of the planes to carry out this project has just completed its flight tests. It is a Fahlin two-place, side-by-side, inclosed cabin monoplane, powered with a Plymouth outomobile engine. It is known as the Plymo Coupe.

As the photographs show, one might think that he were sitting in the driver's seat of his automobile when he looks at the familiar dashboard. The plane is very like a flying automobile. It cruises at 100 miles per hour, lands at 40, and gets 25 miles to a gallon of gas.

Another power plant has been developed for the Bureau by Continental Motors which is only 20 inches in diameter and produces 90 h.p. It is a radial air-cooled type.

A solid steel propeller has been constructed which is more efficient than types in general use and brings about an improvement in cooling the engine.

On August 1st a new contender for the inexpensive light plane honors took to the air with Vance Breese at the controls. The little plane, known as the "Aviate," is a product of the McGaffey Airplane Development Company of Pasadena. It is powered by a converted Ford V8 engine and is engineered to take advantage of mass production methods in manufacture.

The wings are of wooden plywood—covered construction, metal tubing forms the skeleton for the aluminum alloy covered undercarriage and body and the remainder of the airplane is of skin-stressed aluminum alloy construction. A short nacelle houses the cockpit and motor units with booms extending to the rear to carry the tail.

The cabin is designed for mass production in any automobile body works; castings, stampings and fittings are standardized so that many are interchangeable and other construction is simplified. Many parts found in the plane are already being produced in large quantities for other purposes, they have merely been adapted to airplane use. Automobile brakes, racing tires and type of instruments are some of the parts found in the plane that are already in quantity production.

Specifications:

Length overall, 23 ft. 9 in.
Span, 34 ft.
Height, 7 ft. 1 in.
Gross wt. loaded, 1750 lbs.
Empty, 1167½.
Useful load, 582½ lbs.
Payload, 210 lbs.
Airfoil section, NACA 2412.
Power plant, Ford V8—converted—95 hp.—1.885 to 1 geared.
Vertical fin area, 8.2 sq. ft.

(Continued on next page)

Rudder area, 8.1 sq. ft.
Horizontal stabilizer, 16.4 sq. ft.
Elevators, 12 sq. ft.
Ailerons, 15.8 sq. ft.
Total wing plus ailerons, 195.3 sq. ft.
Wing loading, 9 lbs. per sq. ft.
Power loading, 18½ lbs. per horsepower.

Performance data. (Not proven—lack of testing).

High speed, 115 m.p.h.
Cruising speed, 95 to 100 m.p.h.
Landing Speed, 40 m.p.h.
Climb, 750 ft. per min.

The motor burns three gallons of gasoline per hour cruising, according to early tests. Thus the gas capacity of fifteen gallons will afford a cruising range of five hours. Oil capacity; seven quarts. Ordinary automobile gas and oil can be used.

And that veteran racing pilot, Casey Jones, has come to the front with a newly developed belt drive for connecting propeller and motor, thus making it possible to locate the engine down in the fuselage which would have such advantages as lower center of gravity, lower head resistance and more comfort for the occupants.

And so the work of building an airplane for the average citizen goes on. Uncle Sam is determined to put a safe, easy-to-operate plane within the reach of all of us and his Development Section has, if a pun will be pardoned, made a flying start already.

Navi-goid

(Continued from page 21)

position.

"For this, we have a *Drift Indicator* (Figure 'BB').

"This instrument consists of an inverted funnel about 16 inches high, with a lower aperture 5 inches in diameter, shaped as shown. It fits into a flanged ring, which is fixed to the floor of the cockpit. Across the center of the lower open end of the funnel is stretched a "direction" wire, and two cross wires.

"The navigator peers through the eyepiece and rotates the funnel until it is seen that ground objects are passing parallel to the direction wire; in other words, the wire is pointing in the direction in which the machine is travelling over the ground. You will note that in Figure 'KK', the fuselage of the plane is parallel to the intended course. That is due to the fact that the pilot is flying by his compass, with the result that the plane is flying more or less broadside to its actual course.

"So, when the wire is parallel to the actual course, the needle of the drift indicator reveals a difference between the direction wire 'P' and the angle of the fuselage, shown on the calibrated flange (which is clamped on the fuselage). This difference is the degree of drift.

"Sixth, we have *deviation.* Deviation is compass error caused by magnetic forces —motor, etc.—carried by the plane. Deviation can be adjusted on many of the compasses by placing equal magnetized forces on the opposite region of the compass to even or destroy the outlawed magnetic force. *In the NAVI-GOID (until further instructed), we shall assume that the compasses mentioned have been corrected of deviation.*

"Seventh, we have *variation.* It is known that the true poles are not the same geographic location as the magnetic poles. The needle of a magnetic compass, unless influenced by deviation, will always point to the magnetic pole. The importance of this lies in the fact that since a bearing obtained from a map will always be a true bearing, and the bearing given by a magnetic compass will always be a magnetic bearing, it is necessary to convert one to the other before a proper course can be steered.

"It is the difference between the angle a line drawn on a map will make with a true meridian, and the angle it will make with a magnetic meridian, that is named variation.

"The variation is not consistent, due to magnetic fields distributed about the earth's surface, and aviation maps and charts show the correct distribution. In normal flights, the pilot must know his position and the constant change of variation. *However, in the NAVI-GOID, only one variation will be given for the entire flight.*

"When you have the *magnetic bearing* and want to know the *true bearing, deduct westerly variation* and *add easterly variation.* When you have the *true bearing* and want to know the *magnetic bearing, add*

westerly variation and *deduct easterly variation.*

"Therefore, to obtain the true bearing if the variation is 20°W. (westerly) and your compass reads 45° (northeast), you would deduct the variation, giving a true bearing of 25°.

"Now we must consider number 8. Are you using a *map* or a *chart?* A map always has curved meridians, due to the fact that it tends to follow the spherical shape of the earth. Distances on a map are constant and may be plotted in any direction from the given scale.

"However, a *chart* has parallel meridians with equi-angular intersections, and the distortion necessary to produce such a chart leaves the latitude parallels irregular. Therefore, *never use the longitudinal scale to measure any distances on a chart.*

"When measuring distances on a *chart,* remember that one (1) degree of latitude (distance north and south) always represents 60 nautical miles or approximately 69 statute (land) miles. *When you must measure longitude on a chart, use the latitude measurements."*

"So, the last thing to consider is the *true scale of miles.* As I have just explained, on a map use the scale of miles given, because they will be accurate on any portion of the map. However, on a chart, use the latitude scale of 69 statute miles to every degree of latitude."

The youth stirred in his chair. "That makes the ten cardinal points," he said, "Well, I understand the mechanics of aerial navigation but I'm not so sure that I can really plot a course from those readings."

The Captain found a chart of the Atlantic Ocean and he cleared the desk top of the accumulated material and placed it on the flat surface. "I'll tell you what you might do," he suggested. "Here's a chart, a protractor, a pair of dividers and a pencil." He rose and stepped aside. "You take my seat. I'll give you an imaginary course and you see if you can plot it on the chart. Want to?"

"Yes, sir. You bet, sir."

Frontiers of Aviation

(Continued from page 11)

ordered by American Airlines.

Flight tests on what is believed to be America's fastest cruising twin-engined airplane have recently been completed by the Lockheed Aircraft Corporation. Three of these new planes of the Electra 10E type have been delivered to Pan-American Airways. They are powered by two Pratt & Whitney Wasp Sr. type S3H1 engines of 550 hp. at take-off and 450 hp. at 10,500 feet, where they will have a top sped of 215 m.p.h. The planes will cruise at 205 m.p.h. with full load at 9,600 ft. and are of the same general design as other Electras. Their take-off run is 750 feet and will climb at the rate of 1,200 feet per minute. Improved performance on one engine and a new retracting landing gear are other added improvements.

Four Lockheed Electras have been ordered by the Polish airlane, LOT and they will be operated throughout Poland.

Preliminary announcements on a 1936 Beech transport are now being published. It is to be built by the builders of the widely-known Beechcraft. Having two engines and seating six passengers and two pilots, the plane will undoubtedly be used for feeder-line work or as a luxurious club plane. It will be of low-wing design, much resembling the Lockheed Electra in general design. Two 275 hp. engines, perhaps Wright Whirlwinds or Jacobs, will give the ship a cruising speed of about 185 m.p.h. Floats for water operations may be installed with only a slight decrease in cruising speed. Lavatory and a baggage compartment are located in the rear of the cabin. Estimated ceiling of the transport with one engine is 8,500 feet and on both engines about 20,000 feet.

In England, a new all-metal low-wing interceptor has been completed and it has a top speed of 300 m.p.h.! A 12 cylinder in-line Rolls Royce engine is the power plant. Retractable landing gear, trailing edge flaps and an enclosed cockpit are a few of its modern features. The British press has been very excited about the swift plane and already much information concerning it has leaked out and has been published in their newspapers. The ship was built by the Hawker Company and has been accepted by the Royal Air Force.

Among new military planes in this country is the XN3N-1 built at the Naval Aircraft Factory in Philadelphia. Powered by a Wright J-5 engine it will be used for training and observation purposes in our Navy. It is of conventional design and closely resembles the Vought "Corsairs" now being used in the U.S. Naval Air Service.

The new Army Northrop attack is much the same as the A-13 low-wing that was sold to the Royal Air Force last year. The only radical change in its outside appearance is the design of the tail surfaces. They are much cleaner in design than those on former Northrops and are somewhat like those on the Model "A" Stinsons.

It has been said that the Lawrence W. Brown Aircraft Company has designed a new twin-engined 5-6 passenger airplane. Two Menasco engines are to be mounted together in the nose of the fuselage and geared to a single controllable pitch propeller, perhaps as was incorporated in the Lockheed "Alcor."

Short Brothers will presently complete a huge four-engined flying boat for Imperial Airways of England. It will be the first of a fleet ordered by the airline for trans-oceanic service. However, it is not expected that they will be ready in time to inaugurate a passenger service across the Atlantic Ocean before Pan-American has theirs well established which, from present indications, should be early this summer.

The use of four-engined landplanes on our airlines will probably not prevail as soon as is hoped because of the huge expense in producing such planes. However, the airlines will be in great need of larger planes in the near future to meet increased traffic demands, especially when the reported 15 and 25 per cent reductions in fare take place, and when the four-engined landplane transports are built they will be here to stay.

How to Build a Replica of the U.S. Navy Consolidated P3Y-1

From Panama to San Francisco nonstop is the distance record established by the Consolidated P3Y-1, swift Navy patrol boat, first of sixty now being built to protect our Atlantic and Pacific coasts. For the past several months much publicity was given the plane in all sorts of newspapers and magazines. Much was said of its spectacular 3,387 mile flight, but little was mentioned of a still greater flight this same type of plane made a few days later when it swiftly transported a stricken child to a hospital in order to save its life.

The present P3Y-1 is slightly revamped from the first that made its appearance. Changes have been made in the location of the windows on the hull and a new rudder used. Otherwise the general characteristics are the same.

If you wish to square-off the accompanying plans to afford easier measuring, join the corresponding dashes on border. Each square will equal two feet.

Balsa wood should be used in making the model. It may be purchased in any model shop or popular department store. Get dimensions for pieces from plans.

Make the hull first. Draw outline of top view on stock and cut to shape with a jig-saw. Then draw side elevation and cut. Using a sharp chisel or razor blade, shape out the hull as shown by the cross sections. Go over the surfaces with coarse sandpaper to get off all the rough spots and then give the hull a smooth finish with fine sandpaper. If you wish, the pilot's cabin may be hollowed out and a built-up enclosure made of strips of balsa and cellophane used. Use model airplane cement for joining the window panels and cellophane. The rudder, fin and wing mounting may be put on later.

The wing is to be made in three parts, two tapered wing tip pieces and the center section. Draw outline of plan on stock and cut. Make grooves in center section for engine nacelles. Shave down the wing with a sharp chisel as shown by the two airfoil sections on plans. Sandpaper the three parts thoroughly first with coarse and then fine sandpaper. Lay them on a flat surface and join together with cement. Put blocks under the wing tips to give the correct dihedral angle as shown in front view of model.

The tail units (fin, rudder, stabilizer and elevators) may be cut from sheet balsa with a razor blade and sanded to smoothness.

Shape out two engine nacelles and cowls with razor blade and also two wing tip floats and necessary struts for joining to the wing. The three-bladed propellers can be cut from thin strips of balsa as can the four wing struts. Sandpaper all parts to smoothness. Also carefully carve out the streamlined wing mounting.

Brush off all dust and then begin the paint job. Many coats will have to be applied before a smooth finish is obtained. Wait for the previous coat to dry before applying another. It is helpful to go over all the parts with fine sandpaper after the first coat has thoroughly dried. Quick drying dope or lacquer is best to use.

The entire plane is to be painted white with the exception of the wing which is to be yellow and the bottoms of the hull and wing floats which are to be black.

When all paint has dried completely, begin the assembly. First join the wing mounting to the hull with plenty of ambroid and then mount the wing. Take plenty of time and be accurate. Then connect the wing struts to wing and hull.

Cement the two engine nacelles with cowls into the grooves in the leading edge of the wing.

Join the rudder and fin to the tail of the hull and when connections have dried thoroughly, put the stabilizer and elevator pieces in place.

The wing tip floats may be made retractable or in a permanent up or down position. If you desire to make them retractable, small pieces of paper joined with cement may act as hinges. A groove will have to be cut in the bottom of the wing to house the struts. As shown in the front view, the outside struts bend in the middle and the diagonal piece is pushed into the wing as the float retracts.

Using small straight pins or wire as shafts, join the two props in place.

Touch up all connections with cement, paint and the model will be completed.

An Experimental Pusher-Tractor

(Continued from page 8)

from 1/32" sheet balsa of medium hard grade and cement one to each boom. While these are drying, the horizontal stabilizer may be cut from 1/32" sheet balsa also. Now cement each boom, one to each side, to ribs No. 2, making sure that the rudders are upright, and that the distance measures the same across the rear ends as the distance from rib No. 2 on the left panel to rib No. 2 on the right panel. After they have dried, the stabilizer may be cemented to the top of each rudder.

Motor Stick and Propellers

The motor stick consists of a piece of ¼" square hard balsa with thrust bearings and rubber hooks at both ends. The plans clearly showing the correct arrangement, and the overall length measuring 18 inches including thrust bearings. Now the propellers; the blocks before cutting measure 6" x ¾" x 1". The drawing shows the manner in which they are cut. First mark off four equal spaces lengthwise; that is each space will measure 1½ inches in length. Looking at the prop from the side, we find that it tapers towards the tips. To properly taper this, first divide the ends into three spaces as shown on the end view of the perspective drawing of the prop block. Now the only tapering is done by cutting off the face of the prop down to these marks. Next, the hub is formed by cutting out the center section. The drawing contained in the plans shows quite clearly, the proper propeller layout. After this is done, the pitch may be carved into the props, making sure that you do not get them too thin, as this is essentially an outdoor model. After you have carved and sanded your propellers, making sure that you have a pusher prop and a tractor prop, the shafts may be cemented into place, and these are made from 14 gauge piano wire as are the rear rubber hooks. Finally, make and cement to them, the sheet tin or brass bearing surfaces.

Flying

First, of course, the wing must be attached to the motor stick and in doing this, may we remind you that the front (tractor) prop should be on top of the motor stick; that is, the front prop is higher than the rear prop. This adds to the angle of attack of the model when in flight, and thus, adds to its climbing ability. For power, the original model used two strands (one loop) of ⅛" flat rubber on each motor, and this proved to be plenty of power, even though no consideration was given to weight reduction during construction of the ship. May you have much fun and education from this ship.

"Gas Lines"

(Continued from page 7)

to fill the tank and see if it is able to do a little "sky polishing."

"As you will note, the power plant consists of an Elf engine, inverted of which you featured photos a short time ago in "Air Ways." May I mention the fact that my plane is rather large for the engine, as it handles jobs best with about three foot wing spans. In my opinion this is a most agreeable feature as ships powered with an Elf can be placed within your home without taking off the doors to get them in. The bore of the Elf engine is .542.

"Below I list the specifications and performance, which should explain some dimensions, etc.

Specifications

Wing span	4 ft.
Length	29½ in.
Max. chord	6¼ in.
Wing area	252.25 sq. in.
Propeller diameter	12 in.
Angle of incidence	0 degrees
Stabilizer span	19½ in.
Height (excluding prop)	11½ in.
Tread	8½ in.
Mean chord	5½ in.
Wing loading	.083 oz. per sq. in.
Propeller pitch	6½ in.
Dihedral	14 degrees
Weight (Ready to fly)	1 lb., 6 oz.
Aerofoil	Modified Clark Y at center to standard Clark Y at tips.
Construction	Balsa throughout
Power plant	one ELF engine-inverted
Weight of engine	4 oz.
Covering	Mino Tissue

Performance

Take-off run	35 ft.
Gliding angle	13 to 1
Angle of climb	15 degrees
Speed (At 4500 r.p.m.)	25 m.p.h.
Fuel consumption (At 4500 r.p.m.)	1.8 oz. per hour."

Weathers' ship is especially interesting because of its small size. Unquestionably the tendency is to build gas models small, and in time they may be small enough to park in an ordinary size garage without forcing the "Lizzies" and the "Chevies" out into the cold weather.

Picture No. 3 shows the Kresge gas job taking off at the Eastern States Contest held in 1935. Frank Gerstenmier of 417 18th Avenue, Newark, New Jersey, is the builder of the ship. The picture was contributed by Michael Granieri of 696 South 18th Street, Newark, New Jersey. At the right Ben Shereshaw is seen anxiously watching the progress of the flight. Granieri writes and says,

"This ship was flown for the first time at the Lyndhurst High School Contest at Teterboro Airport. The ship cleared the ground after a short run and nosed up into short circles, climbing on its prop. It climbed for altitude and passed out of sight of the field in three and a half minutes. The official time chased by car before it went out of sight was fourteen minutes. The ship was white and blue. The wing and tail surfaces were scalloped with blue and the rest white."

Until this day the ship has not been found. Anyone finding a ship of this description on which is marked "Kresge Aero Club" in big letters will they please notify MODEL AIRPLANE NEWS.

William S. McKenzie Jr., of 313 West Los Olivos Street, Santa Barbara, Calif., writes and says that no data on gas models has appeared in "Air Ways" or "Gas Lines" from his town, so he contributes picture No. 4 in which he is shown holding his six foot, ten inch, gas job. It weighs six pounds and is powered with an inverted Brown Junior motor. A run of only six feet is needed for the take off. Normal flying speed is thirty-five miles per hour and landing sped is twenty miles per hour. Climbs of approximately 375 feet per minute have been recorded. Flight time, up to the time of writing, is nine minutes on a quarter of an ounce of fuel. To date McKenzie has made forty-three flights with this ship, with only two minor crack-ups. It is flying now as well as ever. Evidently McKenzie has kept a log of his flights, for he tells us the total flying time of his ship is two hours, forty-eight minutes.

It appears that many young men are finding the KG model very reliable, for at present they are being built by boys all over the world.

Emerson F. Elwell of 460 West 9th Street, Erie, Pa., sends us picture No. 5, showing the KG-3 which he has built. He says it weighs five pounds, fourteen ounces, covered with model airplane silk and painted with standard airplane dope. It is colored an international orange and blue, and powered with a Brown Junior motor. The plane has been flown about twenty-five times with some minor repairs required. It has never been fueled for full endurance.

Henry Clark of 46 Fort Washington Avenue, New York City, has been kind enough to send us a picture of model builder Petrodes with his gas job at the Junior Birdmen Contest held last fall at Lakehurst. This is picture No. 6. Evidently Petrodes had difficulty in getting to the contest on time, for he arrived too late to enter the ship. However, in spite of this discouragement he flew the model and had some very excellent flights with it. At present Petrodes is working on his third model.

Australia has gone "gas model crazy," it seems. Mr. Ivor Freshman, Secretary of the Model Flying Club of Australia of 67 Liverpool Street, Sydney, Australia,

has recently sent us a number of pictures of the activity in that far-off country. This month we have room for only one picture. It is rather an interesting one; picture No. 7.

It appears that KGs fly just as well in Australia as in America, for in the picture is show a KG model in full flight, built by one of the members of the club. A number of other boys seem to be quite excited about it, for they are apparently making sure that they will be on hand when it lands. This leaves one anxious as to whether they were disappointed or not.

It appears that there are only a very few engines that belong to the club. In fact, there are many more gas models than engines. This necessitates the use of one engine in many ships. The demountable engine unit feature of the KG allows this to be done very nicely. After the engine is flown in one ship and the model retrieved, it is taken out and put in the next plane. This fact is probably responsible for the interest shown by the young men in the picture in retrieving the airplane. If the ship and engine are lost, flights by other contestants are impossible.

More interesting pictures of Australian gas model activities will appear next month.

A picture of an unusual gas model has been sent to us by Douglas C. Dickie of 90 Coogee Bay Road, Coogee, Sydney, Australia. It is shown in picture No. 8. In effect it is a scale model of a Lockheed Vega. He says the performance has been quite satisfactory and he has had a number of flights. The construction of the model includes a seven place cabin with lights, curtains, navigation lights and movable controls. The motor is of one-half horsepower. The span of the ship is seven feet. The amount of power for this span will interest many readers. With this power, the ship should be able to climb nearly vertically, considering that a one-fifth horsepower Brown Junior engine flies an eight or ten foot model, weighing six pounds, exceedingly well.

Some interesting remarks have come to us from articles published in the magazine concerning gas models and also from independent observations on the part of the observers. Here is something interesting from Mr. C. L. Bristol of Box 818, Cheyenne, Wyoming. He says,

"Sometime ago we were discussing the element of punch in magazine material. I now have before me an article that, speaking of punch, packs the great grandfather of all wallops. In fact it carries so much punch that I momentarily feared for the accuracy of my own vision. I refer to 'Test Hopping Without Crack-ups,' by James Condon.

"Since I am dealing with a graduate of Boston Tech, a past master in sines and co-sines, I intend to cling closely to bare facts and bone-dry logic. Would also like to admit that Mr. Condon's article is a step in the right direction, written in good faith and sprinkled with valuable information.

"I understand that a man in good health can, with running pants, spiked shoes and other accessories, clip off about twenty miles an hour in a definite direction and with a clear field. Add to this picture, the potential hazards of obstacles in the path, possible change of direction and business of keeping the slack out of a kite-string, and you have surely reduced our victim's speed to about fourteen m.p.h.

"The KG-2, slowest flying and most stable of any gas model generally known to exist at this time, has a rated flying speed of 15 miles per hour. I noticed at St. Louis last summer that Joe Kovel and the rest of his ground crew were spread out like a couple of frightened rabbits at the moment of getting the KG-2 into the air. Admitting that Joe could probably have kept abreast of the model for a short time after it was in flight, I wonder how well he could juggle a piece of string after the manner prescribed by Mr. Condon and keep up the footwork?

"Another gentleman at the Nationals carried a light bamboo cane, with which he intended to smack the tail of his model into line in case it began to veer off course before leaving the ground. Needless to add that he flailed the air in vain, the while calling upon his dogs and heaven for more speed!

"My point is that the average man, beset with hazards mentioned, cannot outrun the average gas job as it leaves the ground. As for guiding the plane out of a ten-foot-high stall while he comes

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Model Airplane News

on all newsstands March 9th.

to a sliding stop underneath, and with a string attached at the point mentioned, I would like to see it done.

"I am not speaking for myself in this matter, as I personally weigh 220 pounds and run only on state and gravely important occasions. I am thinking only of the cussin Mr. Condon is going to get if any MODEL NEWS readers attempt this string act in the belief that they have at last found the cure-all for crashes. Carrying the idea a step farther, do you not believe that a motorcycle should be provided, as well as enough puppet-strings to do something besides cut the switch when the plane gets in a bad position?

"In closing I take exception to a single sentence in the article: 'Negative incidence is needed when the plane taxies at a fast rate with the tail high.' No airplane, great or small, will taxi at a fast rate greater than its own flying speed without leaving the ground.

"Believe it or not, I thoroughly enjoyed the article for its good points as well as its merry ones. And with gas model aviation coming on, I have not a very high opinion of anyone who allows his subscription to MODEL AIRPLANE NEWS to run out.

(Signed) C. L. Bristol."

The next to the last paragraph in Mr. Bristol's letter may inspire a little discussion. What do some of our readers think about this?

An idea that may be helpful to model builders comes from A. G. Sanderson of 1016D 7th Street, Santa Monica, Calif. It is in regard to turnbuckles that model builders can make easily from fishing tackle swivels. Mr. Sanderson says,

"My son has been building a number of gas models and the last one called for several turnbuckles of the working kind, so I devised this one to answer the purpose. He found that working turnbuckles came to twenty cents apiece and as the swivels came to twenty-five cents a dozen I thought they could be fashioned into a usable article.

"I first cut one loop off one end so as to be able to use it later. After that I drilled a hole in the plane where the loop came out with a number 49 drill and taped the same for a No. 2-56 thread. I then took a No. 2-56 brass machine screw and soldered the loop that was cut off into the head of the screw after tinning the slot in the screw so as to make a sure joint. This completed the turnbuckles and quite a saving in the cost of them resulted.

"After completing several of these turnbuckles my son was able to complete his plane and they look just like the larger ones used on regular airplanes."

Harold L. Stofer of 413 Sanders Street, Indianapolis, Indiana, offers some interesting comments. He says,

"I have built many model airplanes, among them a man-driven glider, and I can say I was never so thrilled as when I flew my first gas model.

"In Indianapolis we have been having some trouble with airports. I realize that it is dangerous to go just anytime and fly a gas model from the middle of a busy field, but if there are to be contests,

then necessary traffic should be allowed to pass through the airport. We have decided to fly any place but at any airport. This will settle all problems if we have a field of our own.

"I don't think this new thrilling sport should be abolished. We know there are many things that aren't perfect, but then there is nothing that is absolutely perfect.

"I hope to be able to fly for many a year."

The next to the last sentence in Stofer's letter is extremely interesting from a philosophical standpoint. After all, perfection is the end of any road.

Mr. John Andrews of 145-36 19th Avenue, Whitestone, New York, offers a hint in his letter which may prove of value. He says,

"We have found that a great deal of experience can be gained by building large rubber-powered models before attempting to construct a large gas-powered model. Experience in constructing strong landing gears, balancing and adjusting wings and tail surfaces and handling the ship in the open, will prove invaluable later on, when attempting to build and fly a gas-powered model successfully."

Apropos of this, fans will be interested to know that plans for a ship will soon appear in MODEL AIRPLANE NEWS, which they can build and use as a rubber powered model or a gas model.

Many fans have indicated their interest in becoming a member of a gas model club. Such a club is in formation at the present time. It is to be called the International Gas Model Airplane Association. All those who are interested in joining such an organization may fill in the coupon appearing at the end of this article and send it to the editor of MODEL AIRPLANE NEWS, 551 Fifth Avenue, New York City. If any information concerning this club is desired, please state your questions and we will endeavor to answer them. Also, if any suggestions occur to you which you feel should be incorporated in such a club let us know what they are. This club is to be for the benefit of gas model builders alone. It is to be their organization, and therefore should have as a background, ideas coming from the gas model fans themselves. Mr. Allen Turner of 2025 Eastern Parkwall, Brooklyn, has the honor of being the first person to apply for membership in the I.G.M.A.A.

Following is an additional list of young men who have sent in their Gas Model History to this column:

Harold L. Stofer, Robert Garbarini, John G. Pritchard, L. L. Wissing, Alfred Parisi, Richard G. Smith, Alvin Tanimoto, W. S. Bostwick, Nelson C. Rieck, Clinton Firtsbrook, D. A. Sogdud, Bob Knoll, Roy H. Finch, Bill Rauh, Robert Potter, Billy Veinot, Edward Magee, Arthur Lesselbaum, Rolland Orwig, George Rakous, Bob Knapton, Jack Boonshaft.

Most of them have built and flown gas models successfully.

For the benefit of those who may have trouble in building stability into their gas models, your editor makes the following suggestions:

1. Make the stabilizer area 30% of wing area.
2. Make the stabilizer arm not less than 45% of the wing span.
3. Make the fin about 7½% of the wing area.
4. Wherever possible, make the machine of the parasol type with the wing well above the fuselage. This insures a low center of gravity and a low center of lateral area, which is extremely desirable.

One of the most important points in gas model designing, especially in fast ships, is that the center of lateral projected area should be close to the center of gravity. If this lateral area is too far above the center of gravity, the ship will have a tendency to dive in on the turns. A very slow ship does not always do this, but the potentiality for such an action always exists.

Ships in which the motor is located at the lower part of the fuselage, usually have this tendency inasmuch as the weight is extremely low and the side area of the fuselage well above the center of gravity.

In the KG model you will note that the weight of the motor is well below the wing, yet it is above the center of lateral area of the *fuselage*. This is an ideal condition. In setting up the angles of a gas job, good results will be obtained in the case of high-wing airplanes, when the wing is set at 2½ degrees and

the stabilizer at positive ½ degree. In low-wing monoplanes, the wing should be set at one degree and the stabilizer at negative 1½ degrees. These angles are all given in relation to the line of thrust or axis of the engine crankshaft.

Join the big parade of model fans who are getting behind this great activity by sending in your application for the International Gas Model Airplane Association. The coupon appears below. There are no dues.

APPLICATION FOR MEMBERSHIP IN THE INTERNATIONAL GAS MODEL AIRPLANE ASSN.
Please Enroll as A

Regular ..... Active .....
Member
Name .....

Address .....

.....
Number of Gas Jobs Built

Date ....

Vital Facts of Model Design

(Continued from page 13)

Fourth, a landing gear is necessary to enable the model to take off the ground and land again in a normal fashion. Of course some models do not have landing gears. Such planes must be launched from the hand and land again as chance dictates.

Fifth, some form of structure is required that will support all these first four factors in their correct relative position. If you build a structure of sufficient power delivery that embodies all of these factors in correct relative arrangement, you will have a machine capable of flight.

Summarizing then, we find that the model must have the following structural factors in one form or another; wings, motor, propeller, tail surfaces, landing gear and framework. Also the combination of these factors must be so proportioned as to produce the arrangement of forces that has been established previously as being correct to fulfil your purpose of a *stable model.*

In your procedure of design, you must first consider the possible arrangement of these various parts that make up the model structure. They can be put together in many ways to form many types of airplanes. After carefully considering these types in the light of their adaptability to the force arrangement required, one must be chosen which you believe will serve your purpose best.

Let us see what different types of airplanes there are. Probably the simplest is a plane with one of each of the required structural factors; one wing, one propeller, one set of tail planes, a simple landing gear and a simple framework. Such a plane would be a single propeller monoplane. If the propeller should be located in front of the wing, it should be a single propeller tractor monoplane, (diagram No. 1.) When the propeller is located to the rear of the main wing surfaces, it is called a single propeller pusher monoplane, (diag. No. 2).

When a plane is equipped with two wings, one above the other, it is called a biplane. Such a plane may be either a tractor, diag. No. 3, or a pusher similar to diag. No. 2, but with two wings one above the other, instead of one. A triplane is a model with three wings one above the other, which may also be of either one of these two types. Diag. No. 4 shows a pusher triplane.

The arrangement of the wings determines still another type of plane. When a machine has two wings or supporting surfaces, one behind the other, it is called a tandem monoplane. Such an airplane may be of either the tractor or the pusher type, or may take the form of a biplane or triplane of either of these types. A pusher model of the contest variety is usually of the tandem monoplane classification, (diag. No. 5). Tractor models sometimes have cambered or lifting stabilizers. In such a model, the stabilizer in effect is a wing, as it supports part of the weight of the airplane and is therefore actually a *tandem tractor monoplane.* Such a model is exactly the same as the one shown in diag. No. 1, except that the stabilizer is cambered (curved side down) and the C. G. is at a point to the rear of the front supporting surface. Of course tandem airplanes can be of the biplane, or triplane variety as well as monoplanes.

Often instead of one propeller, a plane will boast of two. When both propellers are mounted at the nose of the machine in front of the forward wing surfaces side by side, it is called a twin tractor, (diag. No. 6). If the propellers are at the rear it is classified as a twin pusher. This latter type of model is the same as the one shown in diag. No. 5, except it has two propellers at the rear of the large wing, each one usually mounted at the end of a motor stick.

Thus there are two motor sticks or fuselages in a twin pusher instead of one as shown in diag. No. 5. The sticks may be parallel or fastened together at the nose, thereby forming a "V" frame. Actually such a plane is a twin pusher tandem monoplane. Either of the tractor or pusher types may be of the biplane or triplane variety.

Some planes are built without the usual tail surfaces. Actually the wing of such a plane is made in the form of a wide "V", the apex of the "V" being the nose of the plane and the two wing tips, being far to the rear of the nose, act as tail surfaces. The tips in this type of ship are turned upward, thus producing the negative tail effect to create stability.

Models of this type have short bodies. The chief advantage, because of this fact, is the reduction in weight. As a rule, the amount of stability possessed by a tailless plane is less than in the case of the normal type of airplane.

All of the planes shown in the diagrams having landing gears can rise off the ground if the motors generate sufficient power. This classifies them as R.O.G. models. (Rise off Ground) models. If these were not equipped with landing gears they would have to be launched into flight from the hand and therefore would be of the "hand launch" type (diag. No. 5). Model builders often wish to launch their ships from the surface of some body of water and in such cases they replace the wheels with "floats." Such a machine is of the R.O.W. type, (Rise Off Water), and are called hydro-model airplanes or just "hydros".

If a single float is used and the plane boasts of a fuselage as well, it is called a single float hydro. If two floats are used it is a twin float hydro. A flying boat is an airplane, the fuselage or body of which also performs the function of a float. Hydros may be of any of the types with the various arrangements of propellers and wings mentioned above; except, obviously, the hand launch type. A hydro, when it is also equipped with wheels so it can rise from the water or land is called an "amphibian".

Now the correct procedure in designing your model is to choose one of the types enumerated here to fulfill the purpose (stability) you desire. Your choice depends upon your knowledge of the effect of various proportions and arrangement of structural parts. The question is, what type of plane will insure the greatest amount of stability?

A discussion of this question will be given in the article of this series appearing in the April issue of MODEL AIRPLANE NEWS. Until then give thought to this question. Many interesting questions will probably arise in your mind, the answers to which will be given in the next article.

How to Build a Grumman Fighter Model

(Continued from page 27)

model builder's skill, tools and ingenuity. There are hundreds of ways to imitate the engine cylinders, push rods and such. Perhaps you have some pet way of imitating cylinders but I would suggest for the beginner that matchstick sections glued in flat against the front of the engine make good imitations of cylinders. The cowling should be carved back about ¼ inch and then insert the match sections. Pins may be inserted for the push rod effect.

The landing gear in an unretractable state is very simple to make. If the wheels are desired to roll, small axles may be glued from the wheel to the bottom of the fuselage.
wheel and into the fuselage would make a good solid landing gear. In any case, a strut is run from the wheel center to the top of the wheel recesses in the fuselage as shown in the plans. Another strut may be run from the wheel center back to the fuselage.

Final Assembly and Painting

The entire model is painted white with chrome yellow upper wings, a red or yellow rudder and elevator and a red or yellow stripe around the fuselage just back of the pilot's cockpit embracing the "F."

Two or three coats of paint should be used to insure a lasting finish. Colored dope makes a model paint. The cowling is red or yellow and the tires should be made black. For a realistic effect, pin holes can be made to imitate rivets and threads glued around the wings make good imitations of rib bulges. The rear hook for carrier landings at sea can be made by inserting a bent pin into the small blister at the rear of the fuselage. Straws or pins may imitate the engine exhausts protruding from behind the cowling. Radio aerial wires can be stretched from wing tip to rudder for a realistic effect.

A Flying Scale "Leopard Moth"

(Continued from page 15)

is cemented the strut base pieces made from 3/32" stock.

Ailerons are made independent of balance of wing. Rib R-1 is bent to required shape and cemented in place. Cement in all formers, fillets and tip-pieces as shown. Sand leading edge smoothly to shape shown, tapering tips gradually to a thin, sharp, trailing edge. Sand off all irregularities, then dope structure at least once. Refer to plan detail and form aileron hinges from .020" soft brass or iron wire, then cement in place to aileron and wing rear spars in position indicated. Do not cement hinges between spars, since aileron must be free to move in either direction.

Tail Surfaces

Tail surfaces follow the same building procedure. Note method of control on elevators; on one-half, soft wire hinges are used, and on the other half the usual pin-and-eye hinge is used. By this method, both halves of the elevator are moved the same amount and at the same time.

A steel wire reinforcement is cemented to the elevator spar as shown.

Propeller

Propeller blank is shown one-half the actual size on the drawing. Hard balsa, pine or spruce is used. Drill center hole before carving or shaping. The thickness of the blade at one-quarter the diameter, should not exceed 1/8" in the balsa propeller and should not be greater than 3/32" in a hardwood propeller. The "cupping" should not exceed 3/32" in both cases at the same point. Upon completion, propeller must balance perfectly. If not, measures must be taken to make it so. The tip is shaped and center portion cut away *after* propeller has been carved, so that the true pitch is not distorted. Form shaft as shown, from .025" straight steel wire and assemble propeller-plug unit as per details.

Covering

Superfine tissue is used for covering surfaces. Paper adhesive is made by mixing an equal quantity of cement and dope. Bottom of wing is covered first. Cut paper slightly larger than actual outline, apply adhesive to rib R-1 and lay paper over it. When dry, apply adhesive to wing-tip and stretch paper tightly to it. Then apply adhesive to leading and trailing edges, all around aileron cut-out and aileron outline, then neatly press paper to same, working out all wrinkles. Top surface of wing is covered in the same manner, except that the small section between ribs R-1 and R-2 is covered first as a separate unit. The balance of the wing is covered in the manner already mentioned. The tail group is covered similarly. Note a small fillet on bottom of rudder rib T-6. This is cemented in place and finished before covering rudder. The covered surfaces are then sprayed lightly with water, laid on a flat drawing board or plate glass, weighted down around the edges to prevent warping, and allowed to dry naturally. When dry, "dope" paper surfaces at least once.

Assembly

Cement fin spar to stern of fuselage, directly upright. Next, cement stabilizer to fuselage at the proper degree of setting shown, and at right angles with the rudder. Refer to plan and assemble tail wheel fork unit. Details clearly show construction. A rubber pencil eraser is utilized as the shock absorber and it is held in place by cementing to pieces shown. The top section of (N) is filled with wood, the latter serving as a glue base for small rubber shock absorber. Wing struts are cut to size from hard balsa and cemented together. When dry, sand to streamlined section shown and apply at least two coats of dope. Two sets of these "V" struts are required and their ends beveled oppositely to fit, as shown.

Cut away a small section of bottom covering at intersection of R-1 and front spar. This section is cut away so that spar wire-stiffener may be assembled. Apply cement generously to rib R-1 of both wing panels and assemble latter to fuselage. Bend end of wire-stiffener, sink into spar as shown, and cement in place. Top curve of rib R-1 should coinside exactly with contour of fuselage in contact. Cement "V" struts to wire-stiffener and strut base pieces on wing panels. Small struts of 1/16" dowel are cemented to main struts and rib R-4 as shown. Tail struts of 1/32" x 1/16" bamboo are cut to size, streamlined and cemented to fin and stabilizer, in positions indicated. Tail brace wires of silk thread are sewed in place on bottom of stabilizer and to fuselage sides as shown.

Landing wheels used are 1-3/16" in diameter and should be made of hard wood. They are attached to axle as shown in detail. Cooling "gills" are cut to a slightly larger size than shown on side view, from celluloid. After cementing latter in place there should remain a gap of about 3/16" between their edges and the sides of the fuselage. A small piece of straight steel wire is cemented between the top edge of "gills" and cowling.

giving a clean, finished appearance. This wire is shown by a double line over the "gills" on the side and front view details. Numerous other details may be seen by referring to front cover picture. Cut out small section of bottom covering of fuselage, immediately under rear hook to permit access to same. Loop eight strands of brown rubber between front and rear rubber hooks, tying ends neatly.

Form two "S" hooks of .025" steel wire and put small sections of rubber tubing around that part of hook to which the rubber is attached. Attach "S" hooks to each end of rubber motor and attach latter to shaft and rear hook. Lubricate prop shaft and bearing with a drop of oil or melted wax. Propeller must spin freely and must indicate perfect balance.

Coloring and Decorating

Suggested color scheme is all silver, with black details, or, any two colors which present a pleasant contrast, with black details. For good flying, however, the model should be left in its natural color, with black details. Propeller is painted silver in each case; wheel tires—black; wheel hubs—gray or silver. Paint cut-outs in nose piece black. They are clearly shown in front view detail of model.

Flying

Before attempting actual powered flight, the model must indicate good gliding ability. Glide the model indoors, if possible, from a height of about five feet. If the model is correctly balanced assemble. It should glide about fifty feet and land very lightly. If it should dip sharply or stall, it may be either of two things; (1) it may be the position of the center of gravity in relation to the wing. For testing this condition, place fingertips on bottom of ribs R-6 at about thirty per cent to the rear of the leading edge. The model in this suspension should indicate very slight nose heaviness. If this condition is not shown, it becomes necessary to "weight" the nose or tail, depending on circumstances; (2) there may be incorrect setting of wing airfoil, stabilizer or fin. This condition may be "ironed out" to some extent by adjusting the movable control surfaces until satisfactory performance is obtained.

For initial flights, wind prop about fifty times and launch into the wind. If it shows good performance, give 'er all she's got! ! !

Airways—Here and There

(Continued from page 30)

compete for small prizes consisting of kits and supplies. Once monthly Mr. Hulstrunck procures the city armory for a championship contest where the boys really show their stuff.

Wilson Avenue School in Newark will be open every Thursday evening for model flying in the auditorium. More cities should encourage this hobby as an education city project.

The Dunellen Model Aero Club is strangely silent, but we know that they will come to life in time to win some swell indoor prizes. Edward Kelly, President of the club, has planned many activities of which we will hear in the near future.

Some people will be surprised to hear that Nathan Polk has left his position as director of the Bamberger Aero Club. He will organize the New Jersey, Model League which will sponsor the Eastern States Contest in New York in cooperation with Polk's Model Craft Hobbies Store of New York and Newark.

The Kresge Aero Club of Newark is planning an indoor contest to be held in the Sussex Armory in a short time. The following events—Stick and cabin models class B and C, class B indoor glider and flying scale models. This meet promises to be interesting. For more information write the above club.

A contest of special interest to scale model builders of the nation is being conducted by the Birdmen organization. Information concerning the contest may be obtained by writing the scale model competition director at 1834 Broadway, New York City. The prizes to be awarded national winners are: $1,000, $500 and $250.

The following are the results of the regional Junior Birdmen elimination indoor contests conducted by newspapers in 12 cities. At the time of the publication of this issue, seven cities have not been heard from. It is interesting to note that in some cities the champion placed first in all events while in others contestants taking lesser places were able to secure the largest aggregate number of points to win the championship.

Each wing champion was flown to Chicago during Christmas week to compete in the National Finals.

Seattle Post

Wing Champion—Douglas Kruse

Glider Winner—Douglas Kruse		:31
Stick Winner—William Doe		9:38.8
Cabin Winner—Fred Hollingsworth		6:34

Chicago Herald

Wing Champion—William E. Gough, Jr.
Glider Winner—Wallace Simmers.....$1
Stick Winner—Vladimir Vana..... 9:36
Cabin Winner—William E. Gough, Jr..... 9:26

Washington Herald

Wing Champion—Robert L. Wiehle
Glider Winner—Robert L. Wiehle..... :30⅘
Stick Winner—Robert L. Wiehle.....13:8 ⅘
Cabin Winner—Robert L. Wiehle..... 4:35

Los Angeles Examiner

Wing Champion—Don Donahue
Glider Winner—Cliff Cole..... :34
Stick Winner—Frank Salisbury.....12:11
Cabin Winner—Ed O'Donovan..... 7:24.5

Omaha Bee-News

Wing Champion—John Eggleston
Glider Winner—Joseph Reeves..... :25.4
Stick Winner—John Eggleston.....3:45.4
Cabin Winner—John Eggleston.....2:55

Boston American

Wing Champion—Andrew Peter Minkus
Glider Winner—Bruno Marchi..... :32
Stick Winner—Andrew P. Minkus.....10:51⅘
Cabin Winner—Andrew P. Minkus..... 7:43⅘

Syracuse Journal

Wing Champion—Walter Schmidt
Glider Winner—Bruce Winchell.....36:6
Stick Winner—Walter Schmidt.....10:26.6
Cabin Winner—Jean Chadwick..... 7:29

New York American

Wing Champion—Henry Struck
Glider Winners:
Robert J. Keegan..... :42
Henry Struck..... :42
Stick Winner—John Giacobbe.....11:48
Cabin Winner—Henry Struck.....11:3⅘

Baltimore News

Wing Champion—Joseph E. Urban
Glider Winner—Joseph E. Urban..... :33⅘
Stick Winner—Joseph E. Urban.....8:1
Cabin Winner—Joseph E. Urban.....3:15

Rochester Journal

Wing Champion—Leighton Webb
Glider Winner—Bruce DeJager..... :26.4
Stick Winner—Harold DeBolt.....3:48
Cabin Winner—Leighton Webb.....3:24

Pittsburgh Sun

Wing Champion—Edgar Fulmer
Glider Winner—Edgar Fulmer..... :36
Stick Winner—William Bernstein..... 8:51
Cabin Winner—Edward Desiderio..... 5:7.⅗

Detroit Times

Wing Champion—Harold LaClair
Glider Winner—Harold LaClair..... :40.8
Stick Winner—Mitchell W. Stanek.....10:49.4
Cabin Winner—Harold LaClair..... 6:32.2

Aviation Advisory Board

(Continued from page 28)

cial endurance plane, similar to Gordon Ligt's record breaking plane, to climb and stall, with the wing set far back, and continue this until the power is approximately half used and then start out on a long cross-country hop?

Answer: The unstable moment in this case is caused by a combination of very high wing and negative tail. It is produced by an excessive pull of the propeller against the disturbing influence of the high wing and negative stabilizer. When the power grows less, this stable moment becomes less. The way to overcome this difficulty is to lower the wing so that it is closer to the line of thrust or to raise the line of thrust so that it is closer to the wing; or to increase the angle of the stabilizer. This means to make it more positive and less negative.

Question: Which landing gear is a better all-round landing gear considering all factors such as lightness and strength, etc.; a wire or bamboo landing gear?

Answer: A wire landing gear has the advantage of offering very little head resistance, much less than that of a bamboo landing gear of equal strength. This weight, strength for strength, will be very little more than the bamboo landing gear. Personally, we advocate the use of wire. One other reason in favor of the wire landing gear is that if its weight is greater, the weight is greater at the nose of the airplane.

The increased stability due to this condition increases the flying capacity of the model to such an extent that the detriment due to the weight of the landing gear is far surpassed.

Question: Are there any up-currents rising over such objects as high bushes and trees?

Answer: There are two kinds of currents as a rule; those due to rising hot air and those formed by the contour of the ground being of such a nature that the air is deflected upward.

If the wind is blowing against some trees which stand at the edge of an open space, the wind blowing across the open space, then there would be a rising current due to the deflection of the air by the trees. As a rule, high bushes and trees do not cause the air to be heated so that rising hot air currents are produced. Usually the air over trees is cool, and is descending.

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